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TRANSCRIPT OF RECORD

(IN THREE VOLUMES)

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1939 1940

No. 674 12

THE UNITED STATES OF AMERICA, PETITIONER

vs.

APPALACHIAN ELECTRIC POWER COMPANY

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE FOURTH CIRCUIT

VOLUME 2

PETITION FOR CERTIORARI FILED JANUARY 23, 1940
CERTIORARI GRANTED MARCH 4, 1940

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Redirect	725	582

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Glen E. Edgerton—		
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Cross	752	606
Redirect	770	619
Recross	780	626
Mrs. Minnie Lee Ward—		
Direct	787	632
Cross	790	635
Redirect	792	636
Recross	793	637
W. S. Winn—		
Direct	794	637
Cross	808	649
Redirect	889	711
Recross	894	715
Harry M. Trippe—		
Direct	896	716
Cross	926	748
Redirect	955	768
Edwin W. Kramer—		
Direct	956	769
Cross	1000	805
Earl E. Teeter—		
Direct	1051	847
Cross	1084	871
Redirect	1127	900
Recross	1130	902
H. G. Gerdes—		
Direct	1131	903
Cross	1162	926
Redirect	1189	947
Recross	1194	950
Col. Lewis H. Watkins—		
Direct	1203	957
Cross	1256	1000
Redirect	1363	1004
Recross	1365	1006
John R. Douglass—		
Direct	1367	1082
Cross	1384	1095
Redirect	1415	1116
Recross	1421	1120
Capt. C. Stone—		
Direct	1423	1121
Cross	1435	1130
Redirect	1439	1132
Recross	1439	1132

	Original	Print
Record from D. C. U. S., etc.—Continued.		
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E. A. Sherman—		
Direct [omitted in printing]	1441	
C. L. Forsling—		
Direct [omitted in printing]	1453	
Cross [omitted in printing]	1462	
Redirect [omitted in printing]	1472	
Recross [omitted in printing]	1474	
Dr. H. T. Cory—		
Direct [omitted in printing]	1477	
Cross [omitted in printing]	1493	
Redirect [omitted in printing]	1498	
Recross [omitted in printing]	1501	
Redirect [omitted in printing]	1503	
Recross [omitted in printing]	1506	
Redirect [omitted in printing]	1508	
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Direct	1510	1133
Cross	1526	1150
Redirect	1532	1155
Cross	1532	1155
Redirect	1546	1166
Recross	1548	1168
Capt. Phillip C. Elsey—		
Direct	1550	1169
Cross	1561	1178
Redirect	1577	1191
P. A. Gragnon—		
Direct	1579	1193
Cross	1603	1211
Redirect	1620	1224
John D. Fitch—		
Direct	1625	1228
Cross	1630	1231
Redirect	1632	1233
Recross	1632	1233
Roger B. McWhorter—		
Direct	1633	1233
Cross	1674	1266
Redirect	1740	1333
Recross	1743	1335
James W. Johnson—		
Direct	1745	1338
Cross	1792	1380
Redirect	1808	1400
Recross	1812	1410
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John A. Davenport—		
Direct	1835	1415
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	Original	Print
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H. G. Gerdes (recalled)—		
Direct	1871	1441
Cross	1896	1465
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Testimony for defendant.		
C. Rufus Spangler—		
Direct	1939	1498
Cross	1941	1500
Redirect	1944	1503
W. H. Spangler—		
Direct	1945	1503
Cross	1946	1505
Redirect	1951	1509
S. L. Buckland—		
Direct	1952	1509
Cross	1955	1511
Redirect	1960	1516
Recross	1962	1517
B. C. Lilly—		
Direct	1962	1517
Cross	1968	1518
Redirect	1970	1524
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James Adair, Sr.—		
Direct	1971	1524
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Redirect	1976	1528
Recross	1977	1529
N. A. Kersey—		
Direct	1979	1530
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Redirect	1986	1536
H. Palmer Roberts—		
Direct	1986	1536
Cross	1988	1538
J. B. Talbot—		
Direct	1991	1540
Cross	1992	1541
Redirect	1996	1543
William Ingles—		
Direct	1996	1544
Cross	1996	1544
William R. Gerald—		
Direct	1999	1547
Cross	2002	1549
Redirect	2006	1552
Recross	2006	1552

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	Original	Print
William R. Gerald (deposition)—		
Direct	2007	1552
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A. Moore—		
Direct	2011	1555
Cross	2013	1557
Isaac Huff—		
Direct	2018	1561
Cross	2020	1562
Redirect	2023	1564
J. H. Knode—		
Direct	2024	1565
Cross	2031	1571
Redirect	2039	1577
F. B. Kegley—		
Direct	2041	1579
Cross	2070	1604
Redirect	2099	1629
Recross	2102	1631
E. C. Gannaway—		
Direct	2104	1632
Cross	2105	1633
Redirect	2108	1635
Recross	2108	1635
N. B. Harvey—		
Direct	2109	1636
Cross	2111	1638
Redirect	2118	1643
Recross	2118	1643
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Direct	2119	1643
Cross	2123	1647
Redirect	2125	1648
Recross	2126	1649
Redirect	2126	1549
John G. Osborne—		
Direct	2127	1649
Cross	2130	1652
Redirect	2134	1655
Recross	2135	1656
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Direct	2135	1656
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J. B. Snethlage—		
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A. A. L. Mathews—		
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Harold W. Buck—		
Direct	2198	1704
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R. J. Holden—		
Direct	2216	1720
Cross	2236	1737
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H. S. Slocum—		
Direct	2260	1757
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T. A. Patton—		
Direct	2282	1774
Cross	2283	1775
Rufus W. Putnam—		
Direct	2286	1777
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S. M. Yarbro—		
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Cross	2355	1834
Harold A. Thomas—		
Direct	2364	1841
Cross	2422	1883
Redirect	2488	1930
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Daniel W. Mead—		
Direct	2506	1942
Cross	2530	1972
Redirect	2579	2011
F. W. Scheidenhelm—		
Direct	2581	2012
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John E. Carpenter (recalled)—		
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Re-direct	2772	2172
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Re-direct	2775	2174
Rowland P. Castle—		
Direct	2777	2175
Cross	2788	2184
Re-direct	2800	2193
Harry R. Bright—		
Direct	2802	2194
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W. H. Marshall—		
Direct	2810	2202
Cross	2815	2205
Thomas H. Graham—Direct	2828	2214
Roger B. McWhorter (recalled)—		
Direct	2832	2216
Cross	2840	2225
Lewis H. Watkins—		
Direct	2845	2228
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H. G. Gerdes (recalled)—		
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Exhibit No. 100—1926, March 2—Transcript of hearing before Federal Power Commission on Declaration of Intention 3305 2584

Exhibit No. 101—1926, October 28; September 28; November 20—re Application for license. Notice of public hearing at Radford, September 28, 1926. Mailing list of notices September 28, 1926. Transcript of public hearing at Radford, October 28, 1926. Statement filed on behalf of Appalachian Electric Power Co. regarding protests, November 20, 1926 ..... 3329 2604

Exhibit No. 102—1926, September 2—Letter from Curtis, Mallet-Prevost, Colt & Mosle to Federal Power Commission enclosing assignment of declaration from Development Co. to A. E. P. Co. and application for license of A. E. P. Co 3355 2624

Exhibit No. 103—1925, December 9—Telegram to Mr. Merrill, Executive Secretary, from Mr. Kramer re Pitt River 3356 2625

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Exhibit No. 105—1927, May 2—Letter from Mr. Bonner to Mr. Merrill enclosing copy of Kramer's report of Klamath River 3360 2628

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Exhibit No. 106-A—1925, October 23—Letter from L. J. Bevan to C. M. Micou, re drainage areas and run-off (original exhibit) 3383 2635

Exhibit No. 106-B—Memorandum of request of New River Development Company in regard to Report of Chief of Engineers dated Aug. 20, 1925, upon the proposed project of the Company for a water power development on New River, in Virginia, with respect to which declaration of intention has been filed by the Company with the Federal Power Commission, dated Oct. 26, 1925 ..... 3384 2635

Exhibit No. 106-C—1925, October 1, 1925—"Supplemented Memorandum re Declaration of Intention of New River Development Company (original exhibit) 3388 2638

Exhibit No. 107—1926, February 20—Letter from Mr. Merrill, Executive Secretary to, Bascom Slemp giving notification of public hearing of March 2, 1926 (original exhibit) 3388 2638

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Exhibit No. 109—1926, April 15—Charge sheet pertaining to removal of General Taylor's report dated December 29, 1925, from files by F. P. C. (original exhibit)	3388	2638
Exhibit No. 110—"Record of the daily gage readings at Lock No. 24, Ohio River" (original exhibit)	3388	2638
Exhibit No. 111—"Record of daily gage readings at Lock No. 25, Ohio River" (original exhibit)	3388	2638
Exhibit No. 112—4 sheets being "gage readings of Locks Nos. 2, 3, and 4, Kanawha River, and Locks Nos. 26, 27, and 28, Ohio River, during low water periods of 1921, 1925, 1930, and 1932 (original exhibit)	3388	2638
Exhibit No. 113—Diagram showing hydrographs at gaging stations (Kanawha and New Rivers) with published mean daily flows July and August, 1932. Prepared U. S. Engineers Office, Huntington, W. Va., September 1935 (original exhibit)	3388	2638
Exhibit No. 114—1930, July and August—Diagram showing hydrographs at gaging stations (Kanawha & New Rivers) for July and August 1930. Prepared U. S. Engineer Office, Huntington, W. Va., September 1935 (original exhibit)	3389	2639
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Exhibit No. 116—1936, July 7—Diagram "Kanawha River Profile—Backwater studies—U. S. Engineer Office, Huntington, W. Va. (original exhibit)	3389	2639
Exhibit No. 117-A—1936, July 9—Diagram "Rating Curves—Kanawha River Lock No. 2, Mile 84.8, London Dam, Mile 82.81, and Lock No. 3, Mile 79.7—U. S. Engineer Office, Huntington, W. Va. (original exhibit)	3389	2639
Exhibit No. 117-B—1935, December 10—Diagram "U. S. Engineer Office, Huntington, W. Va., Rating Curves—Kanawha River, Locks Nos. 4 & 5, and Marmet" (original exhibit)	3389	2639
Exhibit No. 117-C—1935, December 5—Diagram—"Rating Curves—Kanawha River—Locks Nos. 6, 7, 8" (original exhibit)	3389	2639

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Exhibit No. 119—1935, December—Diagram "Kanawha River and Tributaries—proposed improvements"—U. S. Engineer Office, Huntington, W. Va. (original exhibit)	3390	2640
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Exhibit No. 121—July 4-21, 1936—Gage recorder chart for New River at Eggleston, Va. (original exhibit)	3390	2640
Exhibit No. 122—July 6-21, 1936—Gage recorder chart for New River at Hinton (Packs Ferry), W. Va. (original exhibit)	3390	2640
Exhibit No. 123—1919, August 29. Request for permit for repairs and replacements by Electro Metallurgical Company with following enclosures: (1) 1919, Aug. 29; Letter from W. J. Knapp, V-P, Electro-Met. Co. to Secretary of War. (2) 1919, Sept. 15 and 17; 1st and 2nd Endorsements by Howell and Beach, C. of E. (3) 1919, Sept. 27; 3rd End. by Pillsbury, C. of E. (4) 1919, Oct. 4; 4th End. by Howell, C. of E. (5) Plan of proposed location of replacement dam. (6) 1899, Mar. 2; Letter from Chief of Engineers Office to Major Bixby, C. of E., enclosing permit. (7) 1899, Feb. 27—Permit to Wilson Aluminum Co. (original exhibit)	3390	2640
Exhibit No. 123-A—1934, October 24; Copies of correspondence and reports relating to the Kanawha Falls Plant of Elec-Met. Co. as follows: (1) 1934, Oct. 24; Letter from Capt. Clay, C. of E. to McNinch Chairman, F. P. C. enclosing the following: (2)		

Record from D. C. U. S., etc.—Continued.
Plaintiff's exhibits—Continued. Original Print
1898, Nov. 12; letter from Wilson Aluminum Co. to Secretary of War. (3) Part of handwritten letter to Brig. Gen'l John M. Wilson, Chief of Eng. dated January 26, 1899. (4) War Department memorandum. (5) 1899, Feb. 13; Letter from Major Bixby to Brig. Gen. John M. Wilson, Chief of Eng. (6) War Department memo. (7) 3 endorsements by War Department. (8) Copy of telegram dated Feb. 17, 1899, from Mr. Wilson, Chief of Engineers to Wilson Aluminum Co. (9) Letter dated Feb. 18, 1894, from Wilson Aluminum Co. to Mr. Wilson, Chief of Engineers. (10) Letter from Sec. of War, Feb. 27, 1899, to Wilson Alum. Co. (original exhibit) 3391 2641
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Exhibit No. 126-A—1925, May 27, Letter Mr. Buck of V. B. & B. to General Taylor, C. of E. 3402 2645
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Exhibit No. 132—Plate 11. Diagram showing change in wave as it passes downstream (original exhibit) 3414GG 2675
Exhibit No. 133—March 1930. Discharge hydrograph wave study of New River at Allisonia, Va., from March 11, 1930–March 31, 1930 (original exhibit) 3414GG 2675
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Exhibit No. 135—March, 1930—"Discharge hydrograph wave study New River at Glen Lyn, Va., March 12, 1930–March 30, 1930 (original exhibit) 3414GG 2675

Exhibit No. 136—March, 1930—"Discharge hydrograph wave study New River at Hinton, W. Va., March 13, 1930–March 30, 1930 (original exhibit) 3414GG 2675

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Exhibit No. 138—March, 1930—"Discharge hydrograph wave study New River at Damsite 'A' near Radford, Va., March 11, 1930, to March 31, 1930" (original exhibit) 3414GG 2676

Exhibit No. 139—1930, March—"Discharge hydrograph wave study at Kanawha River at Kanawha Falls, W. Va., March 12, 1930, to April 1, 1930" (original exhibit) 3415 2676

Exhibit No. 140—1930, March—"Discharge hydrograph wave study of New River at Ivanhoe, March 12, 1930, to March 31, 1930" (original exhibit) 3415 2676

Exhibit No. 141—1930, March—"Discharge hydrograph wave study of Kanawha River at Montgomery, W. Va. (Lock #. 2), March 14 to March 31, 1930" (original exhibit) 3415 2676

Exhibit No. 142—1935, System Load Curve, A. E. P. Co. and Amer. Gas & Electric Co.—Weekday, Oct. 28, 1935, Sat. Nov. 2nd, 1935, and Sunday, Nov. 3rd, 1935 3416 2676

Exhibit No. 143—1930, June 1, chart "New Kanawha River Power Waves, 3/11/30 to 4/3/30" (original exhibit) 3418 2676

Exhibit No. 144—10 sheets: Plans of locks and dams, Nos. 2 to 11, inclusive, on Kanawha River, as follows:

(a) Kanawha River—Lock and Dam No. 2;
(b) Kanawha River—Lock and Dam No. 3;
(c) Kanawha River—Lock and Dam No. 4;
(d) Kanawha River—Lock and Dam No. 5;
(e) Kanawha River—Lock and Dam No. 6;
(f) Kanawha River—Lock and Dam No. 7;
(g) Kanawha River—Lock and Dam No. 8;
(h) Kanawha River—Lock and Dam No. 9;
(i) Kanawha River—Lock and Dam No. 10;
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Exhibit No. 145—1935—74th Congress, 1st Session, House Doc. 91, 308 Report of Kanawha River, W. Va., Va., and N. C. 3419 2677

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Exhibit No. 146—Views of shoals and rapids on unimproved section of New River between Wiley Falls, mile 88.6 and Radford, mile 146.1—July 13–15, 1936 (original exhibit) 3445 2714

Exhibit No. 147—Views of shoals and rapids on unimproved sections of New River between Wiley Falls, mile 88.6, and Radford, mile 146.1, and between Allisonia, mile 173.3, and Austinville Lead Mine, mile 190.0—June 22–29, 1936 (original exhibit) 3445 2714

Exhibit No. 148—Photograph of stern of boat showing type of propeller guard in July 1936 (original exhibit) 3445 2714

Exhibit Nos. 149–151, inclusive—Photographs of Gerdes' Party at Bull Falls in July 1936 (original exhibit) 3445 2714

Exhibit Nos. 152–154, inclusive—Photograph of Negro at Bull Falls in a rowboat in July 1936 (original exhibit) 3445 2714

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Exhibit No. 156—Record of hearing before State Corporation Commission containing application and copy of State license (original exhibit) 3445 2714

Exhibit No. 157—Pilot license of John R. Douglass (read into the record) (omitted) 3445 2715

Exhibit No. 158—Map—"Parts of National Forests and Areas approved as National forests within the Kanawha River and New River watersheds" (original exhibit) 3445 2715

Exhibit No. 159—1922, June 12, letter from Geo. Otis Smith, Director U. S. G. S., including the Report #34 enclosed in said letter (excluded) 3445 2715

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Exhibit No. 161—"Graph of stream flow—storm of March 26, 1936—Bent Creek Experimental Forest" (original exhibit) 3446 2715

Exhibit Nos. 163–182, inclusive—"Photos of dams and reservoirs on upper New River showing silt deposits" (original exhibits) 3446 2715

Exhibit No. 183—Views of pools, shoals, rapids, and dams of Kanawha River and New River between London Lock, W. Va., and Hawks Nest, W. Va.—July 22, 1936 (original exhibit) 3446 2715

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Exhibit No. 185—U. S. G. S. "Peterstown sheet" (original exhibit) 3449 2715
Exhibit Nos 186–187—Maps and deed descriptions, re Bluestone reservoir (original exhibits) 3451 2718
Exhibit No. 188—Key property map of A. E. P. Co. for Bluestone reservoir (original exhibit) 3452 2718
Exhibit No. 189—Report (pp. 3–4, 9–39) of Commissioners appointed to view certain rivers within Commonwealth of Virginia (original exhibit) 3454 2718
Exhibit No. 189–A—Map accompanying exhibit No. 189, John Marshall report (original exhibit) 3478 2735
Exhibit No. 190—Series of maps entitled "New River Survey, 1872 and 1878" (original exhibit) 3478 2735
Exhibit No. 191—Kanawha Valley Power Company license for project #1175 W. Va., including London and Marmet Dams (original exhibit) 3478 2735
Exhibit No. 192—Views of pools, shoals, and rapids on New River between Hinton, West Virginia, and Narrows, Virginia—July 19–20, 1936 (original exhibit) 3478 2735
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Exhibit No. 194—Photostat of the chart from automatic gage, at Caperton, W. Va., for period August 8 to August 21, inclusive (original exhibit) 3478 2735
Exhibit No. 195—Blueprint of the recording gage chart at Kanawha Falls, for period July 30 to August 24, inclusive, 1930 (original exhibit) 3478 2736
Exhibit No. 196—Profile of New River, N. C., W. Va. and Va. (original exhibit) 3479 2736
Exhibit No. 197—Map styled "Railroads" (original exhibit) 3481 2736
Exhibit No. 198—Map entitled "New River, Va. and W. Va., Navigation improvements between Hinton and Wilson Creek, 1877 to 1889" (original exhibit) 3482 2736
Exhibit No. 199—Load curve of the Appalachian Electric Power Co. for week ending November 3, 1935 (original exhibit) 3484 2736
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Exhibit No. 261—Map showing existing ferries below the mouth of Wilson Creek on New and Kanawha Rivers (original exhibit)	3486	2736
Exhibit No. 202—Map showing ferries in operation prior to 1935 (original exhibit)	3486	2737
Exhibit No. 203—Photograph album of ferries on New River (original exhibit)	3486	2737
Exhibit No. 204—Illustration showing how Radford project could affect operating results of Bluestone development (original exhibit)	3486	2737
Exhibit No. 205—Photograph taken to show or to determine the direct measurement thickness of sediment in Byllesby reservoir (original exhibit)	3486	2737
Exhibit No. 207—Sedimentation map of Washington Mills reservoir showing original and present contours (original exhibit)	3486	2737
Exhibit Nos. 208–209—Topographic maps of sections of Washington Mills reservoir showing conditions—April 17 and April 23, 1936—after break-down (original exhibits)	3486	2737
Exhibit No. 210—Cross sections showing profiles on two ranges across the Washington Mills reservoir as of 4/17, and again on 4/23, 1936 (original exhibit)	3487	2737
Exhibit No. 211—Columnar sections of borings through sediment of Washington Mills reservoir (original exhibit)	3487	2737
Exhibit No. 212—Sedimentation map of Byllesby reservoir (original exhibit)	3487	2738
Exhibit No. 213—Chart showing longitudinal profiles of Byllesby reservoir (original exhibit)	3487	2738
Exhibit No. 214—Map of Buck reservoir showing present shore line (original exhibit)	3487	2738
Exhibit Nos. 215–217, inclusive—Cross section showing original and present profiles of the Buck reservoir (original exhibits)	3488	2738
Exhibit Nos. 218–220, inclusive—Cross sections showing the original and present profiles of Fields Mfg. Co.'s reservoir (original exhibits)	3488	2738
Exhibit Nos. 221–221-E, inclusive—Charts of the Ohio River, Pittsburgh, Pa. to mouth showing topography and soundings (original exhibits)	3488	2738
Exhibit No. 223—Federal Power Commission, National Power Survey, Principal Generating Plants and Electric transmission lines, United States, 1935 (original exhibit)	3488	2738
Exhibit No. 225—1 page—"Energy transactions between Appalachian Electric Power Co. and interconnected systems, 1934	3490	2738

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Exhibit No. 226—Chart—"Study showing operation of Radford with stream flow conditions, as of the week ending Sunday, November 2, 1930, based on load curve, shape proportional to system load reported by Appalachian Electric Co., for week ending November 3, 1935" (original exhibit) 3491 2739
Exhibit No. 227—Map—"Appalachian Electric Power Co., wave study, New and Kanawha Rivers, March 1930" (original exhibit) 3493 2739
Exhibit No. 228—Map—"New River and Kanawha River Power Waves, March 11 to April 3, 1930" (original exhibit) 3493 2740
Exhibit No. 229—Chart—"Automatic Gauge Records, London and Marmet June 15–19, 1936" (original exhibit) 3495 2740
Exhibit No. 229-A—Corrected Exhibit No. 229 (original exhibit) 3495 2740
Exhibit No. 230—Profile of London, Marmet, and Dam No. 6 pools for June 16, 1936 (original exhibit) 3495 2740
Exhibit No. 230-A—Corrected Exhibit No. 230 (original exhibit) 3495 2740
Exhibit No. 231—Letter dated March 1, 1928, Curtis, Mallet-Prevost, Colt, & Mosle to Federal Power Commission, re Project No. 739, A. E. P. Co. (original exhibit) 3495 2740
Exhibit No. 232—Executive Order of the President authorizing the construction of the Bluestone reservoir project on New River (original exhibit) 3495 2740
Exhibit No. 233—Letter from Wm. W. Belknap, Secretary of War, in answer to the resolution of the House, on February 3, 1871, House Document No. 110, concerning James River and Kanawha Canal (original exhibit) 3495 2740
Exhibit No. 234—"The Congressional Globe"—1873, page 204 and page 206, adoption of resolution offered by Senator Windom (original exhibit) 3495 2740
Exhibit No. 235—"Journal of the House of Delegates of the State of West Virginia for the 11th Session, 1872–3" re James River and Kanawha Canal (original exhibit) 3495 2741
Exhibit No. 236—Report of the Committee of the House of Representatives, containing report No. 76 of the 3rd session of the 42nd Congress, re James River & Kanawha Canal (original exhibit) 3496 2741
Exhibit No. 237—"Congressional Record," Special Session of the Senate of the United States, March 4 to 26, 1873, Volume #1, re James River and Kanawha Canal (original exhibit) 3496 2741

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Plaintiff's exhibits—Continued.	Original	Print
Exhibit No. 238—Report of Major Craighill with report of Engineers Hutton and Harris, "James River and Kanawha Canal, United States Engineer Office, Baltimore, Md., April 11, 1873" (original exhibit)	3496	2741
Exhibit No. 239—Letter from Senator Davis, of the State of West Virginia, to Sec. of War, W. W. Belknap, dated November 12, 1873, re James River and Kanawha Canal [omitted in printing]	3497	2741
Exhibit No. 240—Report of the Board of Engineers of March 18, 1874, on the James River and Kanawha Canal [omitted in printing]	3499	2741
Exhibit No. 241—Report 307, Part 1, Senate, 43rd Congress, 1st Session, "Select committee on transportation routes to the seaboard, April 24, 1874" (original exhibit)	3565	2741
Exhibit No. 242—Photostatic copy of four pages from "Congressional Record," year 1874, re James River & Kanawha Canal (original exhibit)	3565	2741
Exhibit No. 243—Statutes at large, Volume 18, Part 3, Page 237, etc., re Act passed June 23, 1874, chapter 457, for estimates and surveys on transportation routes to the seaboard (original exhibit)	3565	2742
Exhibit No. 244—Report of Major Craighill, Corps of Engineers, U. S. A., entitled "Third Subdivision of the Central Transportation Route, January 13, 1875" (original exhibit)	3565	2742
Exhibit No. 245—Letter (pp. 54–57 printed herein) from the Sec. of War, etc., Senate Document No. 15, 44th Congress, 2nd Session, containing the reports of Major Craighill and Brig. Gen. Humphreys, Nov. 10, 1876 (original exhibit)	3567	2742
Exhibit No. 246—U. S. G. S. Report No. 20, the Whitetop Area, Virginia-Tennessee (original exhibit)	3575	2748
Exhibit No. 247—Photostatic copy of hearing before Major H. M. Trippe, re Diversion of New River to N. C. Jan. 13, 1925 (original exhibit)	3575	2749
Exhibit No. 248—Copy of letter addressed to the Hon. R. J. Noell, East Radford, Va., and signed by R. J. Holden, Professor of Geology, dated March 4, 1936 (original exhibit)	3575	2749
Exhibit Nos. 249–252, inclusive—"Aerial photos of certain reaches of New River, being Nos. 35, 58, 56, 57, in Government Exhibit No. 273" (original exhibits)	3575	2749
Exhibit No. 254—Letter dated November 14, 1927, to Major E. D. Ardery on "New River Development #6, Radford, Geological Examination," signed by F. W. Scheidenhelm (original exhibit)	3575	2749

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Plaintiff's exhibits—Continued. Original Print
Exhibit No. 255—Letter dated November 17, 1927, to Major E. D. Ardery from F. W. Scheidenhelm on "New River Development No. 6 (Radford), Geological Examination" (original exhibit) 3575 2749
Exhibit No. 256—Letter dated October 16, 1931, to Major Fred W. Herman from F. W. Scheidenhelm, pertaining to maintaining pool levels at dams 2, 3, and 4 on Kanawha River (original exhibit) 3575 2749
Exhibit No. 257—Letter dated September 18th, 1934, to Major John F. Conklin on subject of "Hydro-electric project of Appalachian Electric Power Company on New River near Radford, Va.," by F. W. Scheidenhelm (original exhibit) 3576 2749
Exhibit No. 258—Letter of April 2, 1936, to Major John F. Conklin on "Radford Hydro Project of Appalachian Electric Power Company, Capacity Curve of Reservoir," by F. W. Scheidenhelm (original exhibit) 3576 2749
Exhibit No. 259—Letter dated April 12, 1932, to Major Fred W. Herman, on New River Power Wave Study, by F. W. Scheidenhelm (original exhibit) 3576 2750
Exhibit No. 260—Letter dated April 20, 1932, to United States Engineer Department, signed by Daniel W. Mead and F. W. Scheidenhelm, re "New-Kanawha River Power Wave Study" (original exhibit) 3576 2750
Exhibit No. 261—Telegram dated December 10, 1930, addressed to F. E. Bonner, Executive Secretary, Federal Power Commission, sent by F. W. Scheidenhelm (original exhibit) 3576 2750
Exhibit No. 263—Letter signed by John F. Conklin, Lt. Col., Corps of Engineers, District Engineer, addressed to Kanawha Valley Power Company, "Kanawha River pool fluctuations resulting from operation of the Marmet and London hydroplants" 3576A 2750
Exhibit Nos. 264-A, B, C—Aerial photographs of New River from Hinton, W. Va. to Narrows, Va. (original exhibits) 3577 2752
Exhibit No. 265—Document on Report on Application for License, Federal Power Project No. 1175, West Virginia, to Chief of Engineers, U. S. Army, Washington, D. C., dated Feb. 24, 1932, at St. Louis, Mo. (changed to defense exhibit No. 525 as it was already in evidence) (original exhibit) 3577 2752

Record from D. C. U. S., etc.—Continued.
Plaintiff's exhibits—Continued. Original Print
Exhibit No. 266—Dated March 12, 1932, informal comment upon the report of the United States Division Engineer at St. Louis, Feb. 24, 1932, on application of Kanawha Valley Power project No. 1175, West Virginia, by F. W. Scheidenhelm, consulting engineer for applicant (original exhibit) 3577 2752
Exhibit No. 271—Copy of protest to A. E. P. Co. against application of town of Galax, Va., for grant and loan from Government for construction of municipal hydro and diesel engine power plant and distribution system (original exhibit) 3577 2753
Exhibit No. 272—Letter dated April 9, 1932, from George Otis Smith to Mr. Thompson (original exhibit) 3578 2753
Exhibit No. 273—Book of aerial photographs of New River, W. Va., Va., and N. C. (original exhibit) 3578 2753
Exhibit No. 274—An Act approved May 6, 1887, incorporating the New River Steam Boat Company, and authorizing them to operate a steam boat on New River (original exhibit) 3578 2753
Exhibit No. 275—Act of February 3, 1888, of the General Assembly of Virginia, to authorize the Radford Land and Improvement Company to erect a dam across New River (original exhibit) 3578 2753
Defendant's exhibits:
Exhibit Nos. 500–504—Discharge hydrographs, a wave study of New River (original exhibits) 3579 2753
Exhibit No. 505—Document dated May 9, 1927, New River Development Company—Record for minutes (original exhibit) 3579 2753
Exhibit No. 506—Copy of 7th Annual Report of the Federal Power Commission 1927 (original exhibit) 3579 2753
Exhibit No. 507—Gage recorder chart of Kanawha River at Kanawha Falls, W. Va., for the period July 6 to 13, 1936, incl. (original exhibit) 3579 2753
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Exhibit No. 510—Letter dated Feb. 5, 1927 from Major H. M. Trippe to F. W. Scheidenhelm (original exhibit) 3579 2754
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Exhibit No. 514—Letter dated October 20, 1931, from F. B. Duis to F. W. Scheidenhelm re pool levels on Kanawha River (original exhibit)	3580	2754
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Exhibit No. 520—Map entitled "The Middle Atlantic Group comprising Virginia, West Virginia, Maryland, Delaware, and District of Columbia," published by National Power Survey (original exhibit)	3580B	2755
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Exhibit No. 523—Map entitled "Commonwealth of Virginia, State Highway System, State Highway Commission, July 1936" (original exhibit)	3580B	2755
Exhibit No. 524—Map of Giles County, Commonwealth of Virginia, Department of Highways, Richmond, Va. (original exhibit)	3580B	2755
Exhibit No. 525—Copy of a report on application for license, Federal Power Project No. 1175, W. Va., dated Feb. 24, 1932 (original exhibit)	3580B	2755
Exhibit No. 526—Photograph of Shumate Falls (original exhibit)	3581	2755
Exhibit No. 527—Map dated 11/21/1912. Reconnaissance Map of New River from Hinton, W. Va., to Radford, Va., compiled under direction of Major F. W. Alstaetter. (Same as original exhibit 558-G)	3581	2755
Exhibit No. 528—Report of Major Craighill, Corps of Engineers, U. S. A. dated April 17, 1891	3583	2755
Exhibit No. 529—Letter dated February 4, 1930, addressed to Federal Power Commission, signed Appalachian Electric Power Company, by Curtis, Mallet-Prevost, Colt & Mosle	3589	2760
Exhibit No. 530—Memorandum, re Federal Commission's authority to adopt a policy of issuing a minor part license for projects located on non-navigable streams and not involving the use of any land or other property of the United States, dated February 4, 1930	3589C	2762

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Exhibit No. 532—Document dated September 22, 1930, addressed to the President and signed by Wm. D. Mitchell, Attorney General. "The following opinion of the Attorney General was released by the Federal Power Commission, Sept. 26, 1930." 3589PP 2781
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Exhibit No. 534—Photostat copy of letter of October 16, 1930, to Federal Power Commission, signed—A. E. P. Co. by Curtis, Mallet-Prevost, Colt & Mosle (original exhibit) 3589ZZ 2788
Exhibit No. 535—Letter dated November 7, 1930, from War Department, Office of Chief of Engineers, to F. P. C. Exec. Secy. signed for Chief of Engineers by Major J. J. Kingman 3589AAA 2788
Exhibit No. 536—Letter dated October 31, 1930, from F. E. Bonner to A. E. P. Co. re Project No. 739 (original exhibit) 3589BBB 2789
Exhibit No. 537—Letter from F. P. C. to A. E. P. Co., dated November 6, 1930, signed by F. E. Bonner, Executive Secretary, and revised draft of minor-part license 3589CCC 2789
Exhibit No. 538—Photostatic copy of letter of November 3, 1930, to General Brown, Chief of Engineers, and signed by F. E. Bonner, Executive Secretary .. 3590 2790
Exhibit No. 539-A—Letter by Federal Power Commission of December 15, 1930, signed by F. E. Bonner, Executive Secretary to Curtis, Mallet-Prevost, Colt & Mosle (original exhibit) 3590A 2795
Exhibit No. 539-B—"Inclosure 7992, from Federal Power Commission, U. S. Government Printing Office 1927." Marked copy. War Department office of Chief of Engineers, Washington, 11/11/1930, addressed to Federal Power Commission, signed "Lytle Brown, Major General, Chief of Engineers" . 3592 2795
Exhibit No. 540-A—Letter dated 11/28/1930 from F. E. Bonner, Exec. Secy. of F. P. C. to A. E. P. Co. (original exhibit) 3593 2796
Exhibit No. 540-B—Certified copy of action of the Federal Power Commission upon application of the defendant for Minor Part license (original exhibit) . 3593 2796

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Exhibit No. 547—Four pages; namely, page 848 of the Congressional Record for January 10, 1901; page 1001 of the Congressional Record for January 14, 1901; page 1002 of the Congressional Record for January 14, 1901; and page 1096 of the Congressional Record for January 16, 1901 ..... 3595 2807
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Exhibit No. 550—Map "Geological Map of the New River, Cripple Creek region, showing the approximate location of ore openings and properties tributary to the Cripple Creek Extension of the Norfolk and Western Railroad, by E. N. D'In-Villiers, Geologist, 1887" (original exhibit) 3605 2813
Exhibit No. 551—Letter addressed to Dr. J. E. Williams, Dean at V. P. I., Blacksburg, Va., dated February 2, 1936, and signed by R. J. Noell (original exhibit) 3605 2813
Exhibit No. 552—Carbon copy of a letter dated March 2, 1926, addressed to Hon. R. J. Noell, East Radford, Virginia, and without signature except "Dean of the College" and bearing the initials "JEW" (original exhibit) 3605 2813
Exhibit No. 553—Letter dated March 4, 1936, from R. J. Holden, Professor, of Virginia Polytechnic Institute, Department of Geology, Blacksburg, Virginia, addressed to Hon. R. J. Noell, East Radford (original exhibit) 3605 2813
Exhibit No. 554—Album, together with the identification map and the 60 photographs of New River (original exhibit) 3605 2814
Exhibit No. 555—Map showing locations of photographs, and photographs Nos. 114 to 127, inclusive, of New River (original exhibit) 3605 2814

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Exhibit No. 556—Annual report of the President and Directors of the Board of Public Works to the General Assembly of Virginia, in pursuance of an act, entitled "An act creating a fund for internal improvements" (original exhibit) 3605 2814
Exhibit No. 557—Pages 140 and 141 of the Journal of the Virginia House of Delegates for 1817–18 containing a portion of the report of the House Committee on roads and inland navigation brought in on January 21, 1818 (original exhibit) 3605 2814
Exhibit Nos. 558–A–558–G—Map dated November 21, 1912, survey made by Major F. W. Alstaetter, Corps of Engineers. Sheets 1 to 7, inclusive, of the Alstaetter map dated November 21, 1912, marked, respectively, 558–A to 558–G (original exhibits) 3606 2814
Exhibit No. 559—Pages from the Report of the Chief of Engineers for 1875 3606–A 2814
Exhibit No. 560—Report of Chief of Engineers, 1887 3607 2823
Exhibit No. 561—Report of the Chief of Engineers for the year 1888, pages 225, 226, 1760, 1761 (original exhibit) 3612 2832
Exhibit No. 562—Report of the Chief of Engineers for the year 1889, pages 261, 262, 1961, and 1962 (original exhibit) 3612 2832
Exhibit No. 563—Report of the Chief of Engineers for the year 1890, pages 235, 236, 2249, 2250, 2251 (original exhibit) 3612 2832
Exhibit No. 564—Report of Brigadier General Casey, Chief of Engineers, United States Army, to the Secretary of War, dated November 16, 1894, to which is attached a third endorsement by Col. Craighill's underlying report, and also a second endorsement 3614 2832
Exhibit No. 565—Letter from the Secretary of War dated Dec. 16, 1903, transmitting letter from Chief of Engineers including report made by him on New River 3618 2835
Exhibit No. 566—Memorandum to the Secretary of War by Gen. Black, Chief of Engineers, dated May 19, 1916 3623 2840
Exhibit No. 567—Page 1284 of the Annual Reports of the Chief of Engineers of the War Department, year 1917 (original exhibit) 3634 2849
Exhibit No. 568—Copy of letter dated July 1, 1925, addressed to Mr. C. Bascom Slemp, and signed by O. C. Merrill, Executive Secretary of Federal Power Commission 3634–A 2849

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Exhibit No. 570—Letter dated October 24, 1925, addressed to the Federal Power Commission, Washington, D. C., and signed by Curtis, Mallet-Prevost, Colt, and Mosle 3634-C 2850
Exhibit No. 571—Letter of October 24, 1925, addressed to Major General Harry Taylor, Chief of Engineers, War Department, Washington, D. C., signed by Curtis, Mallet-Prevost, Colt & Mosle, as counsel for the Appalachian Electric Power Co., or its predecessors 3634-D 2851
Exhibit No. 572—Report of Major General Taylor, Chief of Engineers, dated December 29th, 1925, addressed to the Executive Secretary of the Federal Power Commission, Washington, D. C. (text of this exhibit is same as Government Exhibit No. 97) (original exhibit) 3604-E 2851
Exhibit No. 573—"Defendant's Exhibit No. 505" identified by Col. Edgerton as a part of the minutes subsequently printed as the minutes of the meeting of June 1, 1927 (original exhibit) 3635 2851
Exhibit No. 574-A—Photostat of letter of July 1, 1927, from Federal Power Commission, addressed to Curtis, Mallet-Prevost, Colt & Mosle, signed by O. C. Merrill, Executive Secretary bearing reference "Ep-739-VA Appalachian Electric Power Company" 3635-A 2852
Exhibit No. 574-B—Certified copy of a part of the minutes of the 88th meeting of the Power Commission held on the first day of June 1927 3635-B 2852
Exhibit No. 574-C—"Federal Power Commission, Washington, D. C. License on Navigable Waters, Project No. 739, Virginia, Appalachian Electric Power Co." with it is a form of license consisting of 16 pages (original exhibit) 3635-C 2853
Exhibit No. 575—Letter dated March 1, 1928, to Hon. Dwight F. Davis, Secy. of War, Hon. Hubert Work, Secy. of Interior, Hon. Wm. N. Jardine, Secy. of Agriculture, constituting the Federal Power Commission, and signed A. E. P. Co., by Curtis, Mallet-Prevost, Colt & Mosle (original exhibit) 3635-D 2853
Exhibit No. 576—Letter dated March 5, 1930, to Lt. Col. M. C. Taylor, Chief Engineer, Federal Power Commission, Interior Building, Washington, D. C., and signed by F. W. Scheidenhelm (original exhibit) 3635-D 2854

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Exhibit No. 578-B—Letter dated October 10, 1930, to the Exec. Secy., F. P. C., Washington, D. C., signed for the Chief of Engineers, by Hugh J. Casey, First Lieut. Corps of Engineers (original exhibit) 3636 2857
Exhibit No. 579-A—Photostatic copy of letter dated November 5, 1930, to Exec. Secy., F. P. C. and signed by Lytle Brown, Major General, Chief of Engineers 3638 2857
Exhibit No. 579-B—Photostat of report entitled "Second endorsement U. S. E. O. Huntington, W. Va., Oct. 18, 1930, Div. Engineer, Upper Miss. Valley Division, St. Louis, Mo., signed by Major Herman, District Engineer." 3638 2857
Exhibit No. 579-C—Photostat copy of report on navigability of New River, Va. (Huntington District, August 29, 1930). Third endorsement office, Division Engineer, Upper Miss. Valley Div., St. Louis, Mo., October 24, 1930, to Chief of Engineers, U. S. Army, Washington, and signed George R. Spalding, Lt. Col. Corps of Engineers 3638 2857
Exhibit No. 580—Memorandum dated October 21, 1930, entitled "Memorandum for Exec. Secy." and signed by J. F. Lawson, acting Chief Counsel (original exhibit) 3647 2865
Exhibit No. 581—Document dated October 30, 1930, entitled "Memorandum for the Sec. of Int., Acting Chairman," and signed by F. E. Bonner, Exec. Sec 3647-A 2865
Exhibit No. 582—Photostatic copy of letter dated November 8, 1930, to Hon. John G. Pollard, Gov. of Va., and signed by F. E. Bonner, Exec. Sec. 3647-C 2866
Exhibit No. 583—Photostat of letter from Hon. John Pollard, Gov. of Va., to Mr. F. E. Bonner, Exec. Sec., F. P. C., dated Nov. 10, 1930 3647-D 2867
Exhibit No. 584—Letter Jan. 27, 1931, from Curtis, Mallet-Prevost, Colt & Mosle to F. P. C. re Project #739 (original exhibit) 3647-E 2867
Exhibit No. 585—Telegram dated January 28, 1931, from F. P. C., signed by George Otis Smith, Chairman, addressed to A. E. P. Co. (original exhibit) 3647-E 2867
Exhibit No. 586—Photostat of letter dated September 18, 1934, to Sec. of War, Washington, D. C., and signed by A. E. P. Co., by George N. Tidd, President 3647-F 2868

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Exhibit No. 587—Photostatic copy of letter dated October 9, 1934, to A. E. P. Co. and signed by G. H. Dern, Secy. of War 3647–I 2871
Exhibit No. 588—Letter dated October 18, 1934, to Hon. George H. Dern, Sec. of War, and signed by George N. Tidd, President A. E. P. Co 3648 2871
Exhibit No. 589—Letter dated September 18, 1934, to Hon. Frank R. McNinch, Chairman, F. P. C., signed by Appalachian Electric Power Company, by George N. Tidd, President (original exhibit) .. 3648–B 2873
Exhibit No. 590—Letter dated October 19, 1934 to Frank R. McNinch, Chairman, F. P. C., without signature but counsel for both sides agreed that it was signed by I. F. Millikan, General Counsel of the Company (original exhibit) 3648–B 2873
Exhibit No. 591—Photostatic copy of letter to M. F. Millikan, American Gas and Electric Company, signed by G. W. Dineweaver, Secretary, Federal Power Commission, dated October 23, 1934 (original exhibit) 3648–B 2873
Exhibit No. 592—Map showing locations of certain photographs from 61 to 113, both inclusive, of New River (original exhibit) 3648–B 2873
Exhibit No. 593—Paper on which Prof. Thomas drew sketch of wave 3648–D
Exhibit No. 594—Hydrograph representing a possible hydrograph of operation of the A. E. P. Co. plant during a rather severe peak load operation, showing the discharge from the plant in cubic feet per second at various hours of the day 3649 2874A
Exhibit No. 595—Chart showing a wave drawn during presentation of testimony of Prof. Thomas 3651
Exhibit No. 596—Diagram of triangular wave prepared by Prof. Thomas 3651–A 2874B
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Exhibit No. 598—Diagram by Prof. Thomas showing reduction of Waves 3651–C 2874D
Exhibit No. 599—Chart upon which Dr. Mead made diagram in connection with his testimony, pertaining to stream flow (original exhibit) 3651–D 2874
Exhibit No. 600—Chart bearing legend, "Profile New and Kanawha Rivers to Forks of New River and North Carolina to Ohio River, showing existing and and proposed power developments" 3652 2874F

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Defendant's exhibits—Continued. Original Print
Exhibit No. 601—House Document No. 306, 74th Congress, First Session, entitled "Ohio River, letter from the Sec. of War transmitting, pursuant to Section 1 of the River and Harbor Act approved January 21, 1927, and Section 10 of the Flood Control Act, approved May 15, 1928, a letter from the Chief of Engineers, United States Army, dated August 14, 1935, submitting a report, together with accompanying papers and illustrations containing a general plan for the improvement of the Ohio River for the purposes of navigation and efficient development of its water power, the control of floods, and the needs of irrigation" (original exhibit) 3654 2874
Exhibit No. 602—This exhibit is the Table 45, Appendix A, referred to in the paragraph 263, page 146, of exhibit 601. The appendices to the reports otherwise embodied in House Document No. 306 (being exhibit 601) were not printed as part of that document (original exhibit) 3654-A 2874
Exhibit No. 603—Photostat of cover page of document entitled "The Ohio River Chart, drawings and description of features affecting navigation, navigable depths and tables of distances for its tributaries, compiled under the direction of the Chief of Engineers, United States Army," and also photostat of page 267 of that document (original exhibit) 3654-B 2874
Exhibit No. 604—Copy of letter dated June 13, 1936, from Mr. Baker to the late Sec. of War, Mr. Dern (original exhibit) 3654-C 2874
Exhibit No. 605—Reply of S. D. Embick, Acting Secretary of War, to Mr. Baker, dated June 22, 1936 (original exhibit) 3654-C 2874
Exhibit No. 606—Letter dated June 26, 1936, from Hon. John Paul to Secretary of War (original exhibit) 3654-C 2875
Exhibit No. 607—Letter dated July 17, 1936, to the Hon. John Paul, from Mr. Woodring, Acting Sec. of War (original exhibit) 3654-C 2875
Exhibit No. 608—Letter dated June 26, 1936, from Col. Conklin, addressed to the Kanawha Valley Power Company (original exhibit) 3655 2875
Exhibit No. 609—Letter dated July 10, 1936, to U. S. District Engineer Office, Huntington, W. Va., signed by Kanawha Valley Power Company, Graham Claytor, Vice President, subject "Kanawha River Pool Fluctuations resulting from operation of the Marmet and London Hydroplants" 3655-A 2875

	Original	Print
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Exhibit No. 610—Letter dated July 28, 1936, from the War Dept., United States Engineer Office, Huntington, W. Va., addressed to Col. F. W. Scheidenhelm, and signed by John F. Conklin, Lt. Col., Corps of Engineers, District Engineer (original exhibit)	3655–C	2877
Exhibit No. 611—Executive Order No. 6251, dated Aug. 19, 1933 (set forth in full at fol. 2900 hereof)	3655–D	2877
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H. G. GERDES—Continued

Redirect examination by Mr. THOMPSON:

Q. Mr. Gerdes, on yesterday on cross-examination I believe you testified that there were some large variations in stream flow at the time you were on the river making your investigation. Will you please give us in second feet the stream variation there?

A. During the period I was on the river the stream flow at Eggleston, for instance, ranged from 1,480 to 2,530 second-feet which was a variation of 1,050 second-feet or about 70 percent. This amounted to $\frac{7}{10}$ of a foot change in depth on the Eggleston gage.

Q. Would $\frac{7}{10}$ of a foot make any difference in going over these bars?

A. Oh, yes; that $\frac{7}{10}$ of a foot obviously is a very large increase over two feet, for instance.

1190 Q. What caused these variations?

A. These were caused by power waves from the Buck and Byllesby Power Plants. The $\frac{7}{10}$ of a foot which occurred during the June week I was on the river is not the largest change or fluctuation. For instance, I noticed on the automatic gage record that on June 13th there was a fluctuation of over one foot. There may be still other larger fluctuations. These were picked more or less at random.

Q. Do you know whether these power waves diminish the controlling depths in the section that you described below the natural flow?

A. Yes; they do.

Q. Yesterday Mr. Jackson asked you about your pushing a boat over Bull Falls and some other places. I believe there were about five of them, weren't there, or something like that?

A. That is right.

Q. Will you tell the court what depths that boat drew?

The COURT. Five boats or five people or five falls?

Mr. JACKSON. Five falls.

A. This boat drew from two and one-half to three feet of water.

By Mr. THOMPSON:

Q. Explain how that was?

A. That was an Engineer Department survey boat equipped with an outboard motor, which, when the boat was in motion, drew from two and one-half to three feet of water.

Q. Did that motor strike the ground at all?

A. Yes; that was the principal cause of our pulling the boat up through these rapids. The outboard motor, as is common with outboard motors, had an unprotected propeller sticking down behind the boat. The river was quite muddy, as it ordinarily is,

and in going up these rapids a number of times we hit shoal spots with the propeller and that slowed up our progress and caused us to decide in these several instances that the most direct way to proceed was to pull the boat up through the remainder of those rapids.

Q. Did you know that detectives or spies were following you up the river?

A. Yes; we did.

By Mr. JACKSON. We have had no evidence yet that any detectives or spies were following him. As far as they know there may have been frankness on the part of Government representatives.

By Mr. THOMPSON:

Q. You saw men following you up the river, didn't you?

1191 A. Yes, sir.

Q. You actually took photographs of them, didn't you?

A. Yes, sir.

Q. When you drew the boat through these places that you speak of, state what you did by way of report?

A. We took photographic——

Q. Did you report the fact to me?

A. Yes, I did.

Q. What did you do with the boat?

A. I went back to Hinton and changed the rig on the boat, put a guard under the propeller and then went back up the river.

Q. What would that guard do with respect to the propeller?

A. That was so situated that it would strike shoal ground before the propeller and protect the propeller.

Q. Is that a crude way of a modern method of constructing boats that go through water depths of this kind?

A. Yes, sir; that was an adaptation which, added to this boat and outboard motor combination, converted it into the rough equivalent of a boat built with a propeller guard for shallow draft navigation.

Q. It is a fact, isn't it, that they do build boats now going over waters of this type so that the propeller is above the bottom of the boat?

A. That is correct. I have used such boats in my work.

Q. You fixed this boat up in a crude way, following that idea?

A. I did.

Q. Then what did you do?

A. I took this boat out to Bull Falls Ferry and run it down through the falls and then turned around and ran it up through the falls.

Q. Were there any detectives watching you at the time?

A. I didn't notice any the second time.

1192 Q. Did you have any trouble going up through Bull Falls?

A. Not the slightest bit.

Q. I hand you marked for identification Government Exhibit No. 148 and ask you what it is?

A. This is a photograph of the stern of the boat we used showing the motor and the propeller guard which were attached.

Q. What was the propeller guard?

A. It consisted of planks set on edge under the stern of the boat to form a so-called skeg which is standard equipment in shallow draft boats, and an iron bar extending under the propeller which also is a replica of a skeg common on a shallow draft boat.

Q. What is a skeg?

A. It is a timber and steel projection extending under the after end of a boat intended for use in shallow water which acts as a propeller guard, protecting it from striking the bottom.

Q. From what angle did you take that picture?

A. This was taken from a position about two feet off the ground, looking up under the stern of the boat.

Q. For what purpose did you take it that way?

A. In order to show the under side of the boat and the propeller guard to the best advantage.

(Exhibit 148 offered in evidence.)

Q. I hand you a photograph marked for identification Government Exhibit No. 149 and ask you if you know what it is?

A. I do.

Q. What is that?

A. That is a picture of the boat and crew approaching the lower end of Bull Falls.

Q. How many were in that boat?

A. Four men.

By Mr. JACKSON:

Q. On what date was that?

A. That was last Monday, the 27th of July.

By Mr. THOMPSON:

1193 Q. I hand you for identification Government Exhibit No. 150 and ask you what that is?

A. This is a photograph of the boat and crew ascending Bull Falls at about the middle of the falls.

By Mr. JACKSON:

Q. On what date was that taken?

A. The same day, July 27th.

(Exhibit 150 offered in evidence.)

Q. I hand you for identification Government Exhibit No. 151 and ask you what it is?

A. That is a photograph of the same boat and crew at the head of Bull Falls, just after having climbed up the rapid.

(Exhibit 151 offered in evidence.)

Q. I hand you, marked for identification, Government Exhibit 152 and ask you what that is, if you know?

A. That is a photograph of a negro boy poling his boat up Bull Falls.

Q. And that boy poled the boat up Bull Falls, did he?

A. He did.

By Mr. JACKSON:

Q. When was that taken?

A. July 27th, 1936.

(Exhibit 152 offered in evidence.)

By Mr. THOMPSON:

Q. I hand you, marked for identification, Government Exhibit No. 153 and ask you what it is?

A. That is a photograph of the same negro boy just as he completed poling his boat up Bull Falls.

(Exhibit 153 offered in evidence.)

Q. I hand you, marked for identification, Government Exhibit No. 154 and ask you what that is?

A. That is a photograph of the same negro boy riding his boat down Bull Falls.

(Exhibit 154 offered in evidence.)

Q. Do you know any reason why you couldn't, from your experience on this river, propel a boat of that type with that protection through the shoals and shallow parts and pools of this river from Hinton north?

A. I do not.

Q. Hinton upstream, I should say.

A. I do not.

1194 Recross-examination by Mr. JACKSON:

Q. You testified on your redirect, Mr. Gerdes, that there was a variation in gage heights by reason of waves from power dams on the river at the time you made this so-called examination survey; is that right?

A. That is right.

Q. Did you measure your depths at the top of those waves or at the trough?

A. The depths were measured at the time that I visited these shoals.

Q. And from that it follows that a good many of them are measured on the peak of these waves, doesn't it?

A. From that it would follow that the measurements were approximately equally distributed over all phases of these waves. Some were at the peak, some were at the trough and some were in the intermediate ascending and descending portions.

Q. I don't know that that follows, but the question I am asking you is—isn't it a fact that you made a good many measurements on these shoals at the peaks of these so-called waves?

A. In answer I would say that probably some of these measurements were made at the peak of certain of these waves; however, no more at the peak than at any other particular phase of these waves.

Q. Isn't it a fact that I could ask you to turn to any one of your measurements on a particular shoal and you couldn't tell me whether it was made at the peak of the wave or not?

A. No, sir; that is not a fact.

Q. You could tell me?

A. Yes.

Q. Turn to 13 and tell me whether it was made at the peak or not and tell me the hour of the day it was made?

A. Shoal No. 13 was visited at about 9:50 A. M. on July 14th, 1936.

Q. Do you know whether that was the time of peak flow or not at that particular point?

A. At that time at Shoal No. 13 there was passing a low crest.

1195 Q. How do you know that?

A. From the automatic recording gage charts.

Q. Is there any automatic recording gage at Shoal 13?

A. No; but there was at Eggleston.

Q. How far away was that?

(Discussion.)

Q. Can you answer the question and say how far that shoal 13 is from Eggleston gage?

A. Eggleston gage is at Mile 120.4 on the river and Shoal No. 13 is at Mile 109.3 which is 11.1 miles downstream.

Q. You said that you made this trip in a boat on this river on July 19th and that you were followed by some detectives; is that right—spies or detectives?

A. I believe some such.

Q. Well, as far as you know, they may have been G-men or Treasury agents or agents of the P. W. A. or W. P. A. or Triple A or some other governmental arm, may they not?

A. Well, that is possible, but not at all probable.

Q. You mean that those agencies haven't had any detectives?

A. These fellows didn't exactly conform to my idea of G-men.

Q. You didn't identify any of them?
A. Oh, yes; I knew who they were.
Q. Who were they?
A. You would like their names?
Q. Yes.
A. A former railroad brakeman and river boatman, now turned farmer, named Bud Lilly, was one of them. The other fellow was a local farmer on the river, I think at Indian Bottom. I wouldn't swear at which of the bottoms he is located—named Billy Harmon.
Q. Don't you think the very circumstances of local farmers along the river seeing three or four fellows out trying to run through Bull Falls was enough to excite their interest and bring them out to watch to see what those fellows could possibly be trying to do?
1196 A. Well, of course, curiosity undoubtedly does a lot of things, but when two men and an automobile truck follow you along for two days, that is kind of stretching curiosity right out of the picture, particularly when they get up at six o'clock in the morning to do that.
Q. So you were two days trying to get up through those falls, walking through the falls?
A. We were two days covering the section of the river. I will say we were a day and a half covering the section of the river between Hinton and the Narrows.
Q. Mr. Gerdes, how long was this boat that you took out on the river?
A. Sixteen feet.
Q. And how wide was it?
A. Five feet.
Q. You are sure it wasn't four feet?
A. Yes, sir.
Q. You think it was as large as sixteen by five feet?
A. Yes. You might ask how I knew that.
Q. If you are anxious to tell me, you can volunteer it. I am willing to take your statement.
A. (No response.)
Q. You said that the river was muddy. Had there been a rain?
A. I don't recall the date of the last previous rain. New River is ordinarily rather muddy. It gets muddier after a rain and then gradually clears up until the next rain, usually more or less turbid.
Q. Isn't New River pretty clear in dry weather?
A. Not during the periods when I was on the river. It clears up rather slowly, because the country through which it flows is evidently silty and the turbidity persists for a considerable time.

Q. Had there been any recent rains at all when you went through there?

A. Yes; there was—of course, I am not trying to give the meteorological statistics (you can get them from the
1197 Weather Bureau) but, as I recall it, there was a considerable rain the night before we made—no, there was a considerable rain on Saturday night which was a day and a half before we made this trip.

Q. That is the reason you selected the time to make the trip, wasn't it?

A. No, the reason I selected that time was because that was when I was at Hinton.

Q. You went to Hinton, of course, for the purpose of making the trip, didn't you?

A. That is right.

Q. So you had that time under your control, didn't you?

A. It rained after I got to Hinton, so that would be arguing a considerable degree of cooperation with the Almighty.

Q. I thought perhaps you relied on the Weather Bureau forecasts. Did you get the stream flow on the gage when you were there trying to run over Bull Falls on that day?

A. No, sir; I didn't.

Q. You didn't do that?

A. I can figure it up here now if you want it. No; I haven't got that chart. However, if you would care for it, I will say that the flow was not remarkably different from what it had been a few weeks previous.

Q. I wouldn't care for that as well as I would a record of what the flow actually was, the gage height. Were there any waves in the river the day you were there?

A. I didn't observe the shore line with that in mind, but I presume that the power waves were coming down the river as they apparently do.

Q. Didn't you try to go over the falls on the crest of one of those waves?

A. No, sir. The time I went over the falls was fixed by the time when the preparation of the boat was complete.

Q. And how many days preparation did you make before you made this attempt?

1198 A. Half a day.

Q. Didn't you tell me last evening that in your judgment the reason you couldn't get over the falls on the 19th was because you didn't have power enough?

A. That was correct. That was one of the reasons.

Q. But this morning you have given another reason, haven't you?

A. That is also correct.
Q. You didn't think of that yesterday?
A. No, sir.
Q. It wasn't very strong in your mind as a reason?
(Discussion.)
Q. What time of day was it when you went over Bull Falls?
A. About 7 o'clock in the evening.
Q. On the 27th?
A. Right.
Q. That was Monday evening?
A. That is right.
Q. You went to Hinton Saturday night, didn't you?
A. That is right.
Q. And you got over the falls by 7 o'clock Monday evening?
A. That is right.
Q. In a 16-foot boat?
A. That is right.
Q. Do you know where the channel is at Bull Falls?
A. I think I do now fairly well.
Q. Did you go over in the channel on the 27th?
A. To the best of my knowledge, we did.
Q. Where did you go over it with reference to the shores?
A. Near the right bank.
Q. Looking down stream?
A. That is right.
Q. Mr. Gerdes, will you look at your Exhibit 149 and tell me whether you and your party are not wearing life preservers?
1199 A. That is correct. Life jackets are required by Engineer Department regulations.

Q. Well, however that may be, when you made this experimental trip over Bull Falls in a 16 foot boat, you and all of your party were wearing life preservers, weren't you?

A. That was required by the regulations with which we complied.

Q. Did you wear life preservers when you were making your measurements on the examination survey?

A. No; I did not. I might also add it was 7 o'clock in the evening and it is customary to wear life jackets about that time because it is cool. During the day the regulations are sometimes not observed.

Q. Whether you were cold or not, you wore the life jackets when you went on the river on the 27th, didn't you?

A. That is shown by the photographs.

Q. You have produced some photographs of a negro boy in some sort of a boat. Did you hire him to make this trip?

A. No; I did not.

Q. He made this trip for nothing?

A. That is right. He just happened to be going by while we were out there and the photographer took his picture.

Q. Just an accident?

A. That is right.

Q. And he was going up and down Bull Falls?

A. Yes, sir.

Q. Just playing?

A. Apparently so.

Q. What size boat is that that the negro boy was in?

A. I didn't measure it. You will have to judge from the photograph.

Q. Well, with your experience with boats, having the benefit of having seen it, don't you know that is nothing but a little rowboat?

A. It is a rowboat.

1200 Q. And he is poling?

A. That is right. However, we were discussing earlier the velocity of Bull Falls and I thought that might be interesting in that connection. You can substitute "fierceness" for "velocity" if you like.

Q. Exhibit 154—isn't that typical of pictures of shooting rapids that we see from time to time, especially of skilled Indians and the like, who having negotiated some certain very wild rivers break into the rotogravure pictures on that basis.

A. No; I wouldn't say so. If you think that the farmers along the river fall in that category, I am afraid I can't agree with you.

Q. You are not trying to testify that this boy in this boat is typical of the farmers along the river, are you?

A. Yes; I am.

Q. Are they all negroes?

A. No; but a good many of them have boats and several of them told about various trips that they had made up and down Bull Falls. One fellow living at the ferry there told us he had gone down the falls in a little ten-foot tin boat.

Q. Don't tell us what your hearsay is.

Mr. THOMPSON. You asked and he is testifying. Let him finish his answer.

Mr. JACKSON. I didn't ask him. The witness is a little too anxious.

By Mr. JACKSON:

Q. I address your attention to Exhibit 154. Does that show that a Negro boy is bringing his little rowboat down against the bank?

A. He is rather closer to the nearer bank than he is to the middle.

Q. You think that is a fair description of his position, that he is rather closer the nearer bank than he is the middle?

(Discussion.)

Q. Why is he in so close to the bank, if you know?

A. Well, I don't know that I could read his mind. Presumably he did that because he felt that way about it.

Q. You don't think the current had anything to do with that?

A. I have no doubt that it did.

Q. You don't think he was trying to get out of the swift part as far as he could?

1201 A. He chose the best place for his boat just as I chose the best place for my boat when I passed that rapids.

Q. That is in order to avoid the currents, as far as possible?

A. Well, his boat had a considerable less draft than mine and he chose the slowest current consistent with the draft of his boat just as I did with my boat when I went through.

Q. What was the draft of the negro's boat, do you know?

A. I don't know.

Q. Do you think it would be as much as four inches?

A. Yes.

Q. It wouldn't be more than that, would it?

A. Yes; I think it would.

Q. Five?

A. If you want me to guess, I will say between six inches and a foot.

By Mr. THOMPSON:

Q. Did you ever see this negro before?

A. No, sir.

Q. Did you hire the negro?

A. No, sir.

Q. Was it or not purely accidental that he was there?

A. Purely a coincidence.

Q. And did he go through by himself or did he have some assistance from anybody?

A. He went through all alone.

Q. And when he came down through he came down through the center, didn't he, or close to the center?

A. He was rather closer to the right bank as shown in the photograph.

Q. Did the negro have a life preserver on?

A. No, sir.

By Mr. JACKSON:

Q. When you say he is rather closer to the right bank than the center, you think, you refer to Exhibit 154. I just want to get how much reliance is to be placed on your educated eye with refer-

ence to judging distances and water conditions. Exhibit 152, I think will help us.

1202 A. When you asked me that question before, you showed me a different photograph.

Q. Look at that one. You still say he is rather closer to the right bank than the middle?

A. Why in this photograph, which is different from the other one, may I again say for the record he is right close to the right bank. He is going upstream in this picture.

Q. And Exhibit 154 is the one which, casting your eye over it, you say you think perhaps he is rather closer to the bank than he is the center?

A. That is right. He is not right up against the shore in this picture, No. 154.

Q. I should say your statement is conservative.

1203 COL. LEWIS H. WATKINS

Direct examination by Mr. THOMPSON:

Q. Colonel, will you please state your name?

A. I am Col. Lewis H. Watkins, Corps of Engineers, United States Army. I am 54 years old and I am residing in Washington, D. C. I am a commissioned officer in the Corps of Engineers, United States Army, now engaged on duty on the War Department General Staff.

Q. What training have you had, Colonel, as an engineer?

A. I graduated from the United States Military Academy at West Point, New York, in the class of 1907. I have had twenty-nine years service in the Corps of Engineers, United States Army. Immediately after graduation I was on duty in surveys for land defense projects involving the construction of topographic maps, the layout of fortifications, estimates of cost, labor and material. I graduated from the Army Engineers School at Washington Barracks in 1913. Immediately thereafter I was on duty in the United States Engineer Office at Washington, D. C., which had charge not only of river and harbor work, but also of the water supply of the District of Columbia, the reclamation of Anacostia flats and the maintenance of fortifications for the defense of Washington.

In 1914–15 I was on duty on a survey for a proposed waterway from Toledo to Chicago, which involved the preparation of plans, estimates of cost for two alternate waterways, each with an estimated cost of approximately $150,000,000.

I graduated from the Army Field Engineers School at Fort Leavenworth, Kansas, in 1916. Immediately thereafter I was assigned to duty as District Engineer in charge of possible rail-

way operations from Brownsville, Texas to Mexico City, Mexico; later as District Engineer, Brownsville District, and in charge of the Engineer Depot.

1204 During the World War I was ordered to France in the fall of 1917 to duty on the General Staff of the American Forces in France. Later when the 1st Army was organized I was assigned to duty as the Assistant Chief of Staff of the 1st Army. After the World War I was on duty for a short time in the office of the Chief Engineers, then as instructor at the Command and General Staff School at Fort Leavenworth.

I graduated from the Army War College in 1925 and from the Naval War College in 1926. Immediately thereafter I was assigned to duty in charge of the United States District Engineer office at Chattanooga, Tennessee, and in addition thereto as the United States District Engineer Officer at Nashville, Tennessee, and a little later, in addition thereto, as the United States District Engineer Officer at Florence, Alabama. I remained on that duty until 1931 when I was ordered to duty in command of Fort duPont, Delaware, and of the 1st Engineer Regiment of the United States Army. I was assigned to my present duty in 1934.

Q. What were your duties on your assignment at Chattanooga?

A. I was in charge of the construction, operation, and maintenance of existing projects on the Tennessee River and its tributaries and on the Cumberland River and its tributaries. I was in charge of the operation and maintenance of the power plant at Wilson Dam. I was in charge of the investigation and reports upon Declaration of Intention, and applications for permits for power projects on the Tennessee River and its tributaries, and on the Cumberland River and its tributaries. I had charge of the survey of the Tennessee River and its tributaries, and of a preliminary examination of the Cumberland River and its tributaries, for their development for navigation, and for the prosecution of plans therefor in combination with the most effective development of the river for flood control, power, and other public beneficial uses.

1205 Q. During your detail at Chattanooga, or immediately prior thereto, do you recall any legislation that Congress passed relative to navigable streams of the United States, and their tributaries?

A. I remember in particular the Act of 1925 and the Acts of 1927 and 1928.

(Exhibit 155, being photostatic copy of pages 1 to 6, House Document 308, 69th Congress, First Session 1926 was offered in evidence over defendant's objection and stricken by the court.)

Q. State if you ever had anything to do with the making of a 308 report on the Tennessee River and its tributaries?

A. I had charge of the survey of the Tennessee River and its tributaries, in conformity with the policy of the Federal Government, for the preparation of plans for the development of our water-ways, and their navigable tributaries for navigation, and for the prosecution of those plans for the development of navigation in conformity with the most efficient development of power, flood control, and other public beneficial uses.

Q. Did you have anything to do with the making of the report?

A. As I stated, I prepared the survey and report.

Q. What became of that report?

A. I took charge of the survey in 1926. I submitted a preliminary report in December 1927. This was forwarded through the Division Engineer to the Chief of Engineers. A complete and final report was forwarded in March 1929.

A. I was going on with it anyway. I was not through. The report was forwarded and approved by the Division Engineer and by the President of the Mississippi River Commission, with suggestions that the project be limited to a smaller extent than that recommended in the report. It was approved by the Board of Engineers for Rivers and Harbors and by the Chief of Engineers and forwarded to the Secretary of War in 1930, 1206 March, I believe. It was forwarded by him to Congress.

The project recommended in the report was adopted by Congress.

By Mr. JACKSON. I object to this statement of the witness. It is irrelevant and immaterial and not part of his qualifications, what Congress did.

By Mr. THOMPSON. It shows he reported it and the project was adopted by everyone and approved by Congress, and upon which Congress voted money.

By Mr. JACKSON. There will be lots of questions about that if that is made an issue in this case, we might spend weeks on that question, whether it was approved by Congress or what was done, and it seems to me no part of his qualifications, but an attempt to bring in this case something incompetent.

By the COURT. He made a recommendation approved by his Chief and adopted by Congress. I think that is all right.

By Mr. JACKSON. Exception.

Q. During your service in the corps of engineers, have you had any actual experience in the improvement and maintenance or in opening channels of rivers for navigation?

A. For five years I had charge of the construction, operation, and maintenance of the existing projects for navigation on the Tennessee River, the most of which were open river navigation.

For three years I had charge of the construction, operation, and maintenance of the existing project for navigation on the Cumberland River, the upper part of which was open river navigation.

While in charge of the Chattanooga District I reviewed and I modified, when necessary, all of the contemplated projects for open river improvements of the whole of the Tennessee River from its mouth to Knoxville, and I did a considerable amount of work in constructing those open river improvements for navigation.

Q. State whether or not you have had any experience in the operation and maintenance of Locks and Dams for navigation?

A. For five years I had charge of Locks and Dams on the Tennessee River, of which there were seven locks and four dams. For three years I had charge of locks and dams on the Cumberland River of which there were about 15 locks and dams.

Q. State whether or not you have had any actual experience in surveys including the preparation of plans for improving waterways by open channel improvements and by locks and dams?

A. The survey of the proposed Lake Erie-Lake Michigan Waterway; the survey of the Tennessee River and its tributaries, and the preliminary examination of the Cumberland River and its tributaries, all considered both open channel improvements and improvements by locks and dams.

Q. Have you had any personal experience in the navigation and inspection of navigable waterways improved by open channel methods and by Locks and Dams?

1207 A. A number of times. I personally navigated and inspected the whole of the Tennessee River from its mouth to Knoxville; the whole of the Cumberland River from Burnside, Kentucky, to its mouth. I inspected the Mississippi River from St. Louis to New Orleans with the President of the Mississippi River Commission and all his District Engineers, we went over and examined practically all of the works of improvement and we discussed them. I inspected all of the locks and dams on the Ohio River from Cincinnati to its mouth, and a number of them several times with the Division Engineer and the District Engineer.

Q. Are you familiar with commerce which may use the waterways with open channel improvements and locks and dams?

A. I am very familiar with commerce which may use the waterways, from a most thorough study of commerce which may use waterways, the survey of the Tennessee River, and also of the Lake Erie-Lake Michigan Waterway. During the inspection trips and navigation trips, to which I have previously referred, I had an excellent opportunity to actually observe boats that were on the river and the freight they were carrying and the difficulties they encountered.

In my personal navigation of the rivers I obtained a very clear idea of the difficulties which they encountered.

Q. State whether or not you were detailed to make an investigation of the Kanawha and New Rivers at any time?

A. In the summer of 1935, I received instructions from the Chief of Engineers, which required me to report to the Attorney General in connection with the Radford case. I reported to Mr. Thompson and he requested me to make such personal inspections of the river, and such studies of same as was necessary to collect information and engineering data necessary to determine the navigability of the New River, and the effects which the Radford
1208 project would or could have upon navigation and interstate commerce.

Q. Since you were detailed, state whether or not you have made any studies of the New and Kanawha Rivers?

A. In conformity with the request of Mr. Thompson, I have twice inspected New River all the way from its mouth to the mouth of Kanawha, as thoroughly as could readily be done by automobile and train.

Q. You stated "New River from its mouth, to the mouth of the Kanawha". Is that right?

A. From the mouth of Wilson Creek to the mouth of Kanawha River. This included observations of the river at many points, inspection of each dam and power project on the New River, and of each dam and power project and locks in connection therewith of the new dams and some of the old dams on Kanawha River.

It also included an inspection of the proposed site of the Radford project, of the Bluestone project, Sandstone Project and many other possible potential projects on the New and the Greenbrier Rivers.

Q. What else did you do, if anything, in making that study?

A. I also read the brief in this case in former law suits, and the Court's decisions.

I also read reports on file in the office of the Chief of Engineers and reports of other officials, including the report of Chief Justice Marshall, in 1912, and the report of Moore and Briggs in 1819.

Q. You stated you read the report of Chief Justice Marshall made in 1912; it should be 1812, should it not?

A. Yes. I also read a number of reports by Major Craighill, Corps of Engineers and his assistants, in 1872 to 1879. I also read the reports of the Chief of Engineers from 1872 to 1902 and the report of Major Alstaetter of Corps and Engineers in 1912.

1209 These reports, when taken together, have large scale hydrographic maps which show the depth of the river. They also contain written detail descriptions giving engineering data on practically every pool and shoal in the entire river, from the mouth of Wilson Creek to the mouth of Kanawha.

They also contained plans prepared by these officers of the corps of engineers, Major Craighill and his assistants, for the improvement of the whole of New River, from the mouth of Wilson Creek to Kanawha River, by open river improvements, supplemented by locks and dams in the worst places.

They also contain information on works of improvement which were actually carried out by the Federal Government for the improvement of the River for navigation. They furnished a great deal of information on past navigation on the river and commerce transported thereon.

I have also read the 308 report, which contains the existing project of the Federal Government for the development of the river for navigation.

Q. May I interrupt you right there? Do you mean by that House Document 91, and I believe this is a copy of it (handing witness Exhibit Govt. 145).

A. House Document No. 91, containing the existing plans of the Federal Government for the improvement of Kanawha River and its tributaries for navigation, and for the prosecution of those plans in combination with the most efficient development of power and flood control.

By Mr. JACKSON. Mr. Thompson, may the record show that House Document No. 91 which you showed to the witness is Government Exhibit 145?

By Mr. THOMPSON. Yes, that is right.

By Mr. THOMPSON:

Q. That is the 308 report that I asked you about, Col. Watkins?

A. Yes; that is the 308 report.

Q. Col. Watkins, I call your attention to Government Exhibits 119 and 120, being Kanawha River and tributaries,
1210 proposed improvements on Kanawha River and tributaries, proposed improvements profile, and will ask you under whose orders they were prepared?

A. They were prepared in conformity with the Act of 1925.

By Mr. JACKSON. We object to the statement as to how they were prepared and that they were prepared in conformity with the Act. Let him state what directions were given for their preparation?

1211 By the WITNESS. They were orders under which the District Engineer carried out his survey. They were the official instructions which the Federal Government issued to these District Engineers office, and they are his law and Bible, and they have to carry it out.

By Mr. JACKSON: I move to strike the answer out.

By Mr. THOMPSON:

Q. Will you look at those exhibits and explain the colors and configurations on there, please?

A. This is a map showing Kanawha River and its major tributaries.

By Mr. JACKSON:

Q. This is Exhibit 119?

A. Yes. It shows new dams on the Kanawha River for navigation. It shows the key project for the development of the major tributaries, including New River, for navigation, and the general plan for the prosecution of those plans in conformity with the most efficient development of flood control, power and other public beneficial uses.

Q. What are the blue colors there?

A. The blue colors show what we may call the run of river project, they have no reservoir storage.

The black project shows existing projects already constructed, including the proposed new navigation dam on the lower river and power project on the New River.

The red projects are storage projects which are used for increasing the flow for navigation on the New, Kanawha, Ohio, and Mississippi Rivers.

Also for flood control and for the most efficient development of power in combination with the development of the Kanawha River and its tributaries for navigation, this part——

Q. Is that Exhibit 120?

A. Yes. This chart is a set-up profile showing all on a single chart, including the Kanawha River, New River, Gauley River, Elk River, Greenbrier River, and Coal River. It shows the same information on the profile that is contained on the map, including new dams for navigation on the lower river, and key projects for reservoirs.

They are shown on this project with red colors which
1212 indicate quantity of storage. They show existing power projects on the New River.

If I may explain, the reservoir projects or key projects on the tributary system for the development of Kanawha River and its tributaries for navigation, and for carrying out those plans in combination with the most effective development of the river for power, flood control and other uses, include improvement for navigation, by increase in stream flow by these reservoirs, on the New, Kanawha, Ohio and Mississippi Rivers and also for the benefit for control of floods on those same streams.

Q. Now I will call your attention to Government Exhibit No. 145, and will ask you to look at paragraph 16 on page 4. (With

the Court's permission I would like to have that read into the record.) Please read that paragraph.

"16. After due consideration of these reports, I concur in the views and recommendations of the Board. The projects authorized by Congress and by the Public Works Administration for the modernization of the navigation works on the Kanawha River, now well advanced toward completion, afford the most effective improvement of the main stem for the purposes of navigation and for the most efficient development of water power in combination with such improvement. The tributaries of the river and especially the New River, have large potential power resources which can be developed by water conservation in storage reservoirs and the utilization of the stored water at a series of dams and power houses. Under effective and unified control these reservoirs can be operated to reduce the height of destructive floods on the Kanawha and Ohio Rivers, to benefit navigation by reducing flash floods from these tributaries, and to increase the low water flow of the river in the interest of sanitation and navigation. Such control can be effected by Federal Construction and operation or by private construction and operation under license from the Federal Power Commission.

1213 A comprehensive plan for the complete development of the water resources is submitted with this report. It can be accomplished in successive steps at a rate suitable for utilization of the power. The work of greatest immediate general public advantage is the construction of the Bluestone Reservoir, which can be operated to afford a large measure of flood control and water conservation and at the same time yield a substantial return from power production. I therefore recommend the construction by the Federal Government of the Bluestone Reservoir project for the purposes of power development, flood control, and navigation in accordance with the general plans set forth in this report with such modifications as may be approved by the Chief of Engineers, at an estimated cost of $13,000,000, provided that definite agreement is entered into before construction is begun for the disposal of the power at prices and under conditions that in the opinion of the Secretary of War will fully protect the public interest."

Q. Now will you please read paragraph six.

A. Paragraph 6 is found on Page 2, and it reads as follows:

"6. The larger tributaries of the Kanawha are susceptible of improvement for navigation by the utilization of the pools formed by the construction of high dams for power and flood control purposes, if locks or other devices are constructed for passing vessels from one pool to another. The large cost of providing and operating such locks or other devices does not appear to be

justified by any commerce immediately in prospect, and no general plans are now presented for the utilization of these tributaries as routes for modern barge navigation. Reservoirs on the New River for power and for the control of flood waters can be operated to afford some beneficial effect on navigation on the main steam on the Kanawha and on the Ohio, and will reduce the heights of destructive floods on these streams. General plans for such reservoirs are herein considered."

Q. Colonel, have you studied the width and depth of the pools of the New River?

1214 A. Yes.

Q. What would you say as to whether they are satisfactory for navigation?

A. The pools of the New River constitute about 85 percent of the total length of the New River from its mouth to the mouth of Wilson Creek. In other words, about 214 miles of the total 252 miles, of the river. The reports which I have previously referred to indicate that the width of these pools are about 300 feet wide at the mouth of Wilson Creek, that the river gradually widens to between 1,000 and 1,100 feet, and contracts again at the Lead Mines to about 450 feet; between Radford and Hinton the river varies between 500 feet and 1,000 feet.

By Mr. JACKSON:

Q. Colonel, would you mind stating what reports you are now interpreting?

A. They are the official reports—that last statement, for example, is from the report by Major Alstaeter in 1912, and the one of the upper river was made by an assistant to Major Craighill.

Q. Are you referring to the mile by mile survey now?

A. I am. Then the width of the river becomes narrow again, the gorge section. A study of the map which, in the section covered by the Radford Pool, indicates that the width of pools there are about 800 to 1,000 feet, maybe more. In other words, it is quite a wide section.

So much for the width of these pools. The previous report and the hydrographic map accompanying those reports show that the average depth of pools on the upper river is about four feet.

By Mr. JACKSON:

Q. Will it be inconvenient for you to give a reference to the report you are relying upon as you go along, by name?

1215 A. Very well, Report of the Assistant to Major Craighill, I think it was approximately in 1874, and it was printed maybe in 1875 or 1878, the one covering the upper river, states that the average depth of the pool on the upper part of that section is about four feet.

Q. That is again the mile by mile survey?

A. Yes; it is. And about 5 feet in the Radford Section.

An examination of the map accompanying the report of the section between the Lead Mines and Hinton, I believe it was made in 1878, show many soundings have been made along the pool.

By Mr. THOMPSON:

Q. May I ask you at this time if you are referring to the report of Chief of Engineers of 1879, House Document, Part II, Volume II, 46th Congress, Second Session?

A. I have to look and find the section covered by these reports and they are not always shown in a very convenient place.

By Mr. JACKSON:

Q. I just wanted to find out whether #35 was the Exhibit.

A. The figures I mentioned were on the survey of the river from the Lead Mines up to the head of the river.

These reports contain information on the Greenbrier and on the Elk. This document here contains information on the improvement of New River from the Lead Mines in Wythe County, Virginia, to the mouth of Greenbrier River, West Virginia.

This is Executive Document 1-2, Volume 2, 46th Congress, Second Session, and is marked Exhibit No. 35.

Q. I hand you Government Exhibit No. 31, and will ask you what that shows?

A. This is an examination and survey of New River from the mouth of Greenbrier, West Virginia, to the Lead Mines in Wythe County, Virginia.

Q. Please examine it and see if it shows the mile by mile report?

A. The best mile by mile description of this section is the Report of Moore and Briggs, wherein they describe each of those shoals. I will have to go through it and take time to find
1216 the pages on which this part of the river is covered by the report.

Q. Here is Government Exhibit 32, being the report of Moore and Briggs, and will ask you if that shows any mile my mile report?

A. The Moore and Briggs report, Government Exhibit No. 32, gives a detailed description of each shoal and method of improving the river.

By Mr. JACKSON:

Q. Over what stretch?

A. That is what I am trying to find out now. Over Dunlaps Creek, Ogleys Creek, Howards Creek, Greenbrier River, New River, from the mouth of Greenbrier, up to Sinking Creek.

Now, continuing with my description of the depth of these pools from the maps accompanying the reports of these officers of the Corps of Engineers, I readily estimate the average depth of the pools in the section between the Lead Mines and Hinton, to be approximately four to six feet, and on the section of the river from Hinton to Kanawha Falls, some six to eight feet. The depth of some pools are greater and some less.

Now, considering the large portion of the river covered by these pools, their great width and the depth, I say, they are very satisfactory for the transportation of loose logging and rafting, boats and barges of shallow draught, pleasure boats, fishing, and so forth.

By Mr. THOMPSON:

Q. Give the depth of the water over the shoals, rapids and falls of New River for various stages.

A. Check on the actual length of the shoals in New River, indicates that about fifteen per cent only about fifteen per cent of the river is in shoals. In other words, I believe that is——

Q. Did you say fifty per cent?

A. Fifteen per cent. I believe that is about thirty-six miles only of the total of 252 miles.

1217 Q. What is the depth?

A. The official reports previously referred to, that is, the one for the survey from the Lead Mine to the mouth of Wilson Creek, and the report of Major Allstaeder, in 1912, indicate that, in their natural condition, at the worst of the rapids the depth available at low flow was approximately one foot.

Q. What is the depth at Eggleston?

A. The depths I have given refer to low flow. By the study of—but, of course, that does not hold true to other stages of the river.

Q. Please state whether or not in your opinion New River can be improved to maintain a three-foot navigation of greater depth over the shoals, rapids, and falls, over low flow periods.

By Mr. JACKSON. We object to the question as being irrelevant and immaterial.

The above objection was overruled by the Court and the defendant by counsel excepted to the ruling of the Court for reasons stated.

A. May I explain that shoals are obstructions to navigation, in general, are only during periods of low flow. As the stages of the river rise above low flow, the elevation of the water in the upper end of the pools increases much more rapidly than it does over shoals until soon the slope over shoals and rapids alike become more and more uniform, until eventually the shoal is eliminated as an obstruction to navigation.

The dams on the Tennessee River are a good explanation of this fact.

By Mr. JACKSON. We object to any testimony with reference to the conditions on the Tennessee River.

The objection is overruled and the defendant, by counsel, excepts to the ruling of the Court.

By the WITNESS. Very well. In the development——.

By Mr. THOMPSON. Can he answer, Your Honor.

By the COURT. He has already answered; let it stand.

By Mr. JACKSON. May I ask if the witness is to proceed with any comparisons, because, if so, I wish to object.

By the WITNESS. No, sir; I will not make any comparisons. I will illustrate the design and the effect and operation of dams on the Cumberland River, which are like the other rivers in the whole United States. It is a fact that this hydraulic effect——

By Mr. JACKSON. (Interrupting.) I move to strike the reference to the Cumberland River and object to any testimony of the witness in comparing the stated condition of the Cumberland River or any other river.

By the COURT. I do not understand that he will do so.

Counsel for the Defendant excepted to the ruling of the Court for reasons stated.

By Mr. THOMPSON:

Q. Express your view with respect to the effect of boulders and obstructions of that kind on New River.

A. There are many boulders in New River. However, these boulders would not block the channel to boats in general—boats can pass them. If most of them are concealed, and not known, they would be dangerous to navigating New River. However, if the best channel in the river be marked out with buoys in the water or stakes on the shore and the boulders within the channel are removed, it is possible for one to navigate the river safely, if he knows how to operate his boat and knows how to follow those channel markers.

Q. State whether or not in your opinion New River can be improved to maintain a three-foot navigation of greater depth over the shoals.

By Mr. JACKSON. May we note our objection to the relevancy of the question and that the Court overruled the objection and we excepted to the ruling of the Court?

By Mr. THOMPSON. I want to call the attention of the Court to the decision of the Supreme Court, which has repeatedly used the phrase "susceptible to improvement for navigation." That is what I am bringing out.

By the COURT. All right.

The defendant, by counsel, excepted to the ruling of the Court for reasons stated.

A. The reports of the officers of the Corps of Engineers, previously referred to—those between 1872 and 1879, show that
1218 the whole of New River, from the mouth of Wilson Creek to the mouth of the River, may be improved for navigation by open channel improvement, supplemented at the worst places by locks and dams, or locks and short canal sections.

By the COURT:

Q. From your answer—you were asked whether or not in your opinion it could be improved, and you said the reports of somebody else said it could be. We have that report here; it has been here for a long time. We want your opinion.

A. Very well, sir. From a careful study of their reports and the description of these shoals and looking at the plans which are shown on the reports, it is my opinion that New River may be readily improved for navigation by open channel improvements, supplemented by locks and dams at the worst places, and it may be readily improved by high locks and dams for nine-foot navigation.

By Mr. THOMPSON:

Q. Does that include—you expressed your opinion, not only the views you got from studies of others, but from your own personal opinion as to the navigation of the river?

A. Yes, sir; my own personal opinion from the study of maps, and not only the reports of these engineer officers, but the maps of the United States Geological Survey. That is data which an engineer needs more than anything else for making his study and forming his opinion.

Q. In your inspection of New River, did you find any artificial obstructions to navigation?

A. Yes, sir.

Q. What?

A. There was a dam across New River a short distance below the mouth of Wilson Creek; there was another at Washington Mills; there was the Buck and Billesy projects and the Hawks' Nest project. While the pools of these dams are a benefit to navigation, the dams built across the river have no provision—the main dam has no lock and no provision for the passage of logs or small boats, and so will prevent the use of the river for loose logging and rafting and small boats and shallow draft boats, engaged in carrying commerce on the river.

1219 By Mr. THOMPSON:

Q. In your studies, have you noted other artificial interference with navigation?

A. Yes, sir.

A. I discovered that; during the years, the summers of 1930 and 1932, the Buck and Byllesby plants, in carrying peak loads, were appreciably fluctuating the navigable depth of the river and rendering them more or less unreliable.

Q. Rendering what unreliable?

A. The navigable depth.

By Mr. JACKSON:

Q. That is New River that you are talking about, it is?

A. Yes, sir; New River.

By Mr. THOMPSON:

Q. Let us say the effect on the navigable capacity or channel of waterways.

A. Must I answer the question?

Q. Yes.

A. Yes.

Q. What was that personal experience?

A. While I was in charge of the Tennessee River, I received complaints——

By Mr. JACKSON (interrupting). We object to the statement of the witness of what complaints he received, if any. He can tell whether or not he made studies of the Tennessee River or any other river, but he does not need to detail the complaints or the places where he says he found——

By the COURT (interrupting). I presume that this is preliminary to his saying that he made an investigation because something incited him to do it.

By Mr. JACKSON. Without being boring, I would like to make one observation. I am familiar with the method of qualifying an expert, when he says he studied certain questions while on the Tennessee River, as District Engineer, but I am not familiar with the method of qualifying an expert, where he says he has complaints on the Tennessee River and goes into details in regard to that. The only material thing is that he made certain studies, and, unless his qualifications are questioned, he need not go into the nature of these complaints.

By Mr. THOMPSON. I asked if he had had any personal experience.

By the COURT. I think that is a sort of opening statement, just like in a criminal case of a revenue officer, where he says that, as the result of complaints, he visited a certain residence, and so on, stating his reasons for having been there. I think that is all. We do not want the nature of the complaints, but that he made investigations as the result of it having been brought to his attention that an unsatisfactory condition existed. He can tell that.

By Mr. JACKSON. We will take an exception to the ruling of the Court, for reasons stated.

A. As the result of complaints from boatmen going aground in the Tennessee River, when they expected good water, and they could not understand why the boats had gone aground.

By Mr. JACKSON. We move to strike that statement so far.

By the COURT. Tell us what you found—why the boats went aground.

By Mr. JACKSON. May I further say this. If it is competent for the Colonel to tell what he found about boats going aground on the Tennessee River, it must be competent for us to examine and see where and when and go and check and see if they did go aground. I am not familiar with that method of qualifying an expert witness, and have never seen it done before. The only thing it seems to be is an attempt to bring in, under the guise of qualification, testimony as to conditions on other streams. If they were issues, I would not hesitate to meet them, but I hesitate about it, when we are already engaged in a long case of this kind—I hesitate to embark on a collateral inquiry as to the conditions on the Tennessee River.

The foregoing objection was overruled and the Defendant, by counsel, excepted to the ruling of the Court for reasons stated.

By the COURT. Confine the witness to your question, Mr. Thompson.

By Mr. THOMPSON:

Q. Give the result of your investigation of conditions of this kind on the Tennessee River.

By Mr. JACKSON. We object to that, as directly involving testimony as to conditions on the river. He asked for the results or conditions on the river.

By Mr. THOMPSON:

Q. Do you know where Hale's Bar Power project is on the Tennessee River?

A. Yes, sir.

By Mr. JACKSON. We object to that as being immaterial, irrelevant, and incompetent.

The objection is overruled, and the Defendant excepted for reasons stated.

By Mr. THOMPSON:

Q. Was Hale's Bar Power project operated in your time?

Counsel for the Defendant objected to the question as being immaterial, irrelevant, and incompetent; the objection was overruled and the Defendant excepted, for reasons stated.

A. Yes, sir.

Q. Were there ever any complaints in regard to the waves made by Hale's Bar Power project on the Tennessee River?

By Mr. JACKSON. We object to that as being irrelevant, incompetent, and immaterial.

The objection was overruled by the Court, and the Denfedant, by counsel excepted to the ruling of the Court for reasons stated.

1220 By Mr. THOMPSON:

Q. Where is the Hale's Bar Power project?

A. It is a short distance below Chattanooga.

Q. Did you make an investigation of the complaints that came from Hale's bar—because of complaints of Hale's Bar project?

A. Yes, sir.

Counsel for the defendant objects to the question and moves to strike the question and answer from the record, which objection is overruled and the Defendant, by counsel, excepts to the ruling of the Court for reasons stated.

By Mr. THOMPSON:

Q. From your study of the Radford project and studies that others have made on this river, to which you have referred, and your investigation on the ground, state whether or not in your opinion, the Radford project, if constructed, could affect the navigable capacity on the New and Kanawha Rivers.

By Mr. JACKSON. We object, because it is not shown that the New River has any navigable capacity, and we further object because it is again in the disjunctive and could be answered "Yes", although there would be no effect on New River and Kanawha River, and vice versa. We are entitled to have a question that does not permit of a Delphic Oracle answer.

By the COURT. You said New River and the Kanawha River, Mr. Thompson.

By Mr. THOMPSON. Yes, sir, we still regard that as one and the same river.

By Mr. JACKSON. I don't want you to change the facts.

The objection of the Defendant is overruled and the defendant, by counsel, excepts to the ruling of the Court for reasons stated.

A. Yes, the New—the Radford project, as proposed by the Defendant, could affect navigation by its lock and dam—by the operation of its reservoir.

By Mr. JACKSON:

Q. When you say "by its lock and dam", that confused me.

A. By its dam and pool. May I change that?

By Mr. THOMPSON:

Q. In what way?

A. Let me finish the other. By its reservoir operations—by the carrying of peak loads and by increasing or decreasing the

height of floods, by the operation of its flood gates, and by the proposed design of the dam.

Q. How may it affect navigation with its dam and pool?

A. The pool, when full, is about 21 miles long, and when drawn down to its full extent, about 17 miles. It would furnish excellent navigation within the length of its pool for 6 and 9 foot boats, It would furnish an excellent harbor for assembling loose logging and rafting; it would furnish an excellent harbor during floods for boats of all kinds. Those of course, would be beneficial effects on navigation.

The dam built across the river, as proposed in the plans, makes no provision for a lock, nor for a chute for the passage of logs or small boats. It would, therefore, stop navigation which may be going up and down the river at the dam; that would adversely affect navigation.

1221 By Mr. THOMPSON:

Q. How may the Radford project effect existing Interstate Commerce by this reservoir?

By Mr. JACKSON. We object to the question.

By Mr. THOMPSON. Change it to navigable capacity.

By Mr. JACKSON. On what?

By Mr. THOMPSON. On New River.

By Mr. JACKSON. We object to that, because it does not appear that New River has any navigable capacity.

The objection is overruled and the Defendant, by counsel, excepts to the ruling of the Court, for reasons stated.

A. The Radford project has a reservoir capacity of 100,000 acre feet, as contained in the plans now. It is a fundamental principal, governing the operation of a reservoir, which is one of a group of hydroelectric projects, that the reservoir be used for reducing or cutting off the stream-flow whenever there is abundant power at the other hydroelectric projects in the system.

Now, in the normal lay-out of a group of hydroelectric projects, the storage project is placed at the head-water of the group, because from there the regulated power which it furnishes passes not only through its own head, but over the head of the other power projects below.

Now, in that condition, when it does reduce or cut off the flow of the stream, it cannot cut it off entirely, because to do so during the low flow—would cut off all power of the system—so, in the normal situation, the reservoirs do not cut off all of the flow during low flow. Now, the lay-out of the hydroelectric projects of the Appalachian Electric Power Company is very unusual.

The proposed Radford project is below the Buck and Byllesby projects. When there is abundant flow at these projects—let us

say, then there is a local rain on the upper river, or during a flood, the Radford project may be cut off—may cut off the flow, without reducing the flow at the Buck and Byllesby projects in the least. The same thing applies to the hydroelectric projects on the James and the other little river over the mountain—I forget its name. In other words, cut off the flow entirely at any time, whether high or low or normal, when there is abundant flow at the other projects.

The Appalachian Electric Power Company has leased the power stations at the London and at the Marmet and at the Winfield dams. These dams are submerged during floods for a
1222 number of days. They cannot, therefore, be relied upon to assist in carrying the prime peak load of the Power Company's system, for which you must always have available at any time necessary power to supply your maximum demand.

Furthermore, their permit from the Federal Power Commission requires them to maintain a minimum low flow.

By Mr. JACKSON. We object to the statement of the witness as to what the permit contains. It speaks for itself.

By the COURT. You said that Marmet, London, and—that those dams would be submerged at times?

A. Yes, sir.

Q. With what effect?

A. They can furnish no power when submerged, or when it reaches near the top of the dam.

Q. What relation would that have to the operation of the Radford dam?

A. It means simply—it is my intention to bring out the fact that the shutting off of the Radford project will not cut any prime load-carrying plant out of this system. You see what I mean, sir?

In other words, the Appalachian Electric Power Company can still carry its prime power load without running its low head projects, which are submerged in flood and cannot be depended on during a maximum peak demand. Do you get the idea?

Q. If water gets high enough to submerge Marmet and London, it does not matter what Radford does with reference to interfering with navigation?

A. No, sir; but inasmuch as they cannot be counted on in floods, Your Honor, the Appalachian Electric Power Company must have, in addition to the plants, sufficient power plants ready to produce sufficient energy to carry this peak load.

Now, in addition to that factor, the regulations that it must maintain low flow at all times, means that there will be times——

By Mr. JACKSON (interrupting). We object to all the interpretations of the licenses and the documents made by the witness

as to the relations between the licensee and the Government. It is perhaps only descriptive, but I don't want to be understood as accepting the interpretation of the witness as to these matters.

By the WITNESS (continuing). In so much as these projects in the lower river cannot develop more power at
1223 the time of minimum low flow, than the minimum low flow power, they cannot be used for carrying peak loads. In other words, in low flow periods, when there is minimum low flow, these projects cannot pond water for peak loads, they must pass all water as soon as received to maintain minimum low flow. They cannot be relied upon for carrying peak loads. They may, of course, do so at times, but I mean relied upon.

This is a second reason why these projects are not prime power projects in this system. Therefore, the Radford reservoir can cut off its power without cutting off water from the prime projects carrying its peak load. It may cut off water flowing to London, Marmet and Winfield.

Now, the purpose for which these three dams down there may be particularly used are for furnishing power during low flow, for conserving water in the Radford reservoir, and for permitting the Radford project to fill whenever they can.

By Mr. JACKSON:

Q. Are you speaking of projects on the Kanawha?

A. I am, exactly; yes, sir. Therefore, it is very clear that in carrying out the fundamental principles of the operation of a reservoir project in a group of hydro-electric projects, the Radford project must cut down the flow—reduce and at times cut off, even during low flow perhaps, the flow of the stream at its project whenever there is ample power at those other projects.

It must be so in order to secure—the maximum economical returns from its reservoir. It must do that often—at times, in low flow, and at times in mid-flow and times in high flow.

Mr. THOMPSON. I desire at this time to offer in evidence a document marked for identification Government Exhibit No. 156, being a record before the State Corporation Commission covering the application of the Appalachian Electric Power Company for a license to construct a hydro-electric development on New River near Radford, Virginia, and this contains the hearing and the license, and the license is referred to in both the complaint and the answer, and I am offering it as a public document at this time.

Mr. JACKSON. We do not question the authenticity of the document, and we do not object to that part of the document which embodies the license issued by the State of Virginia. We object to the record of the minutes of the application and hearing as incompetent, irrelevant and immaterial in this case.

The COURT. Is there any objection other than its irrelevancy?

Mr. JACKSON. I don't think it would be a competent method of making proof at the hearing of this case if it is offered to prove facts that may be adverted to at that hearing. I don't know what it is offered for.

The COURT. I see no objection to allowing it to go in as a whole, subject to your objection.

Mr. JACKSON. May we have our exception to all of the exhibit except the license?

The COURT. Yes.

By Mr. THOMPSON:

Q. Colonel, I believe before lunch you testified that the Radford project, from your study of it, would have to be run as a peak load project to be efficient and economical?

A. Yes.

Q. If run as a peak load project, what effect will the cutting off or reducing of the stream flow by the Radford reservoir have on the navigable capacity of New River?

Mr. JACKSON. I object to the form of the question because it assumes a cutting off if run as a peak load operation, and also on the ground that it assumes the navigable capacity of New River, not shown in the testimony, and that if run as a peak load, it will have to cut off.

The COURT. If it is to be operated as a peak load project, I think it will be proper for the witness to say what that will involve.

By Mr. THOMPSON:

Q. What effect would the running on a peak-load have
1224 on the stream flow of the New River below the dam?

A. To fully answer your question, it is necessary to show that it will have to do it in order to secure the maximum economic return, and the amount of cut-off and the stages at which it is cut off. In that connection, the plans of the project as submitted by the defendant show the hydraulic capacity of the plant to be about 9,000 cubic feet per second. I believe they have stated in court that it has been changed to 8,000. The regulated flow of the stream at the plant is approximately 1,230 cubic feet per second.

By Mr. JACKSON:

Q. The regulated flow?

A. The regulated flow. The average annual flow is approximately 3,300 cubic feet per second as claimed by the defendant. Considering the large number of steam plants owned by the defendant, the fact that the application shows that is is to be used to furnish power for public use, the Radford project must be

used to carry peak loads in order that it may secure the most economic return from its project. I will tell you why. If it is not used to carry peak loads, the maximum power which it may develop from the plant is that of low flow power which is only approximately 8,000 to 10,000 kw. Only that amount may therefore be used by the company in meeting the demand for power, that is for prime power purposes. Now, by the simple process of ponding the stream flow at night and on Saturday afternoon and Sunday, or the whole of Saturday, it will be able to carry a peak load which will constitute prime power to meet its power demands many times more than the low flow power. If it is not used for peak load, it will be necessary for the Appalachian Electric Power Company to construct or maintain in service and to operate and maintain all or a greater part of approximately
65,000 kw. of auxiliary steam plants and operate those
1225 steam plants to carry peak loads. The regulated low flow at the project is approximately 1,230 cubic feet per second. By ponding they may increase that power or flow to the maximum capacity of the unit which is 9,000 cubic feet per second. Cutting off of the flow at night and on Saturdays and using this water for power during the middle of the week would cause fluctuations in the stream flow below the project varying from zero to 9,000 cubic feet per second. The volume in this daily load is important in this problem. During the period of low regulated flow the daily volume which it may accumulate for its weekday load is approximately 3,000 acre-feet. The volume which it may accumulate during periods of average annual flow is 8,000 to 9,000 acre-feet. From my experience as an expert who has worked out hydraulic effects of changes and alterations in the stream flow, I know that this wave would go all the way down the New River and down through the new project they are constructing there, though those latter projects without any reduction in any way whatsoever, into the Ohio and down the Ohio until it is dissipated by the regulating effect of one foot in each of the low Ohio dams. This would, of course, cause a wide fluctuation in the navigable depth in the New River below the Radford project, being reduced to zero immediately below the project, to about one-half foot at Hinton and, before the Bluestone project is built, it would widely fluctuate the operation of the old wicket dams in the Kanawha River. It would require continuous operation of the bear trap dams in the Ohio River. It would cause large fluctuation in the upper ends of the pools of the dams, both new and old, in the Kanawha and Ohio Rivers.
In the new dams which we are now constructing, this fluc-
1226 tuation would amount to first approximately one foot above the horizontal, to one foot below the horizontal, or below

a particular stage at which the river was running at the time the wave came down. It may be low flow, it may be average annual flow, or higher.

By Mr. JACKSON:

Q. Does the last statement refer to the Kanawha dams and pools?

A. The new Kanawha dams. I am not going into the old ones.

By Mr. THOMPSON:

Q. Colonel, if there are waves created by a discharge that are intermittent and they are carried down the river as far as the London and Marmet dams, what effect will that have in the pools behind these dams?

A. As I have already explained, it would fluctuate the pools to an elevation about one foot above normal to about one foot below normal in the new dams on the Kanawha River. This would reduce the navigable capacity of the water. With a nine-foot waterway it would reduce the navigable capacity approximately eleven percent. For example, barges which go in the nine-foot waterway, a fleet of them would be able to carry approximately eight freight trainloads of 20 to 40 freight cars each, could with this reduced fluctuation carry much less trainloads because they could not be loaded to full capacity. If they did, they would run aground. On the New River it would reduce the navigable capacity to almost zero. In the Bluestone project after it was built it would fluctuate the upper end of the pool approximately ten feet.

Q. Will you please state to the Court what you mean by fluctuate, is that oscillating the water?

A. I have a chart by which I can explain it.

By the COURT. I want to be certain I understood something in your previous testimony. I understood you to say from a standpoint of economy, economical operation at this proposed plant at Radford, would make it necessary for it to be operated as a peak-load plant?

A. Yes, sir; that is correct.

By the COURT. I understood you to say that would 1227 involve the use of its capacity, hydraulic capacity?

A. The greater part of it.

By the COURT. Which involves the discharge of 9,000 cubic feet per second?

A. Yes, sir.

By the COURT. Sometime in your testimony you spoke of a run-off amounting to 3,000 feet, when was that?

A. During average annual flow. I mentioned that in order to explain.

By the COURT. In what period of time would they discharge that amount of water?

A. Daily, during every week day, that is, during Monday, Tuesday, Wednesday, Thursday, and Friday, that is normally if required, and you would expect sometimes to get that every one of those days, just like that.

By the COURT. It would be more than that in twenty-four hour operation?

A. But in order to get the maximum economical returns it should not be operated twenty-four hours, because if it did so, it could turn out only about eight to ten thousand kilowatts for use in carrying its prime load; whereas, by using it to carry peak loads it can at any and all times carry a peak load of 75,000 kilowatts. It has just got that property, that is the peculiar property of hydro-electric plants, if you can get enough stream flow to pond to carry that big a peak.

By Mr. THOMPSON:

Q. The map on oscillation I believe is Government's Exhibit #118. Will you explain that?

A. This chart is a profile of the Kanawha Rivers. It shows both new and old dams in the river, including the dams
1228 and elevation of the upper end of the pools, and in addition thereto it shows and gives a pictorial view of the rise above normal pool created when the crest of the wave arrives. It also shows a drop below horizontal which would be caused by these fluctuations. The reason it would drop below horizontal is due to physical laws that are well known to engineers, and it is well known to all laymen.

As a boy you have no doubt carried a bucket full of water and if you are not careful and swing it a little too hard this way and that, (indicating with hands), the water will slush over the top.

You have also perhaps set your soup plate upon the table, not carefully, but tipped it, and the water (soup) spilled over the top.

I take this pointer in my hand and hold it at one end with my left hand. Its normal point of rest is vertical below my finger. With my right hand I pull it to the right one and one-half feet. It is now ready, with the law of gravity acting upon it, to swing on an incline slope just like the water running into a reservoir. I release it from that position and it falls, not only to the point of rest but to approximately the same distance beyond. If, in addition to turning it loose, I give it a shove, there is another force acting on it, in addition to the force of gravity—upon the head of the water, that is the momentum of water that would cause it to continue still farther.

Now it is a fact well known to engineers that the normal point of rest of water in the pool of a dam is the horizontal. If water flows

into the pool it causes the upper end of the pool to rise above the horizontal, and it holds it there fixed, just like I held this pointer in my hand, it holds it fixed at that point as long as the discharge continues. If that discharge stops the water may fall. It is
1229 acted upon by two forces, the force of gravity on the head above the normal point of rest, and it is acted upon by the momentum of the large body of water moving through the pool of the dam, so if the flow be cut off those two forces will cause the water in the upper end of the pool to fall, not only to horizontal, but below the horizontal, my experience has been, to a distance approximately equal to that at which it was held above. So that is what you see here.

Now in explaining its navigable capacity, let us look at those pools. You will note in the section near the dam the water is deep, but in the upper end of the pool it becomes shallower and shallower, until finally at the point you enter the lock it is only twelve feet below the normal pool. These dams were designed with a lower miter sill twelve feet below the normal pool, and the channel was dredged from the river to the lock. I have indicated in brown the area in which there is comparativey shallow water, in the upper and of these four new dams. That was the situation when the dam was first constructed, and after the channel to the lock was dredged.

Whenever a small flood or the tail of a big flood flows through the upper end of these pools, there will be material deposits of silt and sand and gravel in the upper end of these pools, so that you will not have the depth which this indicates, but a shallower depth. The engineering department has to operate and keep that channel down to the nine-foot depth. It expends a large amount of money on it annually.

Q. How does it do it?

A. By dredging operations. Now boatmen in navigating the river know what depth they can expect. They know what bars they can go over. They know how great a load they can
1230 put on, and watch the weather reports, and rains that fall on the river above. They get a report an inch rain has fallen at Galax, or the upper New, and they know that within so much time you are going to have so much water down on the Kanawha. These fluctuations are a very important item in the navigable capacity of a water way.

Q. What has been your experience in dams at the upper end of the pools with respect to the deposit of silt?

A. It is a well known fact that they do fill up, and we have to go and dredge out the channel leading into the lock and, at times at some troublesome bar you have to go out and dredge after each flood, and for some reason long after a flood has passed. The

final settlement or adjustment of bars will cause the navigable depth to be reduced at those bars.

Q. Is there a necessity for dredging in the face of the dams as well as the back parts of the pools?

A. You mean near the dam?

Q. Yes.

A. No, you have deep water there, it is the upper end of the pool which I have shaded in brown on this chart that is critical.

Q. Do I understand you arrive at the situation here where the upper end of your pool has been lessened in depth because of the deposit of silt and that meeting with a condition of oscillation in the pool reduced the depth of the water from above so you have a shallow depth, shallower than normal or naturally, in the back end of the pool?

A. You would not have the indicated reliable capacity of depth, which means capacity, with or without additional dredging, but the additional dredging required makes it all the more aggravating. This fluctuation means you have to maintain

1231 one foot greater depth than you would without it.

Q. Would such a condition arise behind the pools of the London and Marmet dams, provided there was a cut-off of the flow of New River?

A. Yes, sir.

Q. From the Radford dam site?

A. I think unquestionably the waves coming downstream would create fluctuations in these pools. I say so because the characteristic wave of the New River as indicated by studying it, is approximately the same shape as the power load of the Appalachian Electric Power Company, and the experience which I have had has shown that power plants carrying commercial load and cutting the load off at the rate that those plants do for commercial loads, does have that effect. So we seem to have all the conditions similar.

Q. I call your attention to Government's Exhibits #117-a, b, c, d, e, and f, being rating curves, and ask you what relationship they bear to this stream flow?

A. These curves may be used to determine a fair measure of the effect of fluctuations in the upper end of these pools.

Q. Will you explain what you mean by that?

A. When I was assigned the duty of studying the effect which the Radford project may have upon the navigable capacity of the water ways of New River I knew from my previous experience that it would fluctuate the upper end of the pools of dams, so I asked the U. S. District Engineer office, at Huntington, for a rating curve below the pools of the new dam, and he stated they had none. Then I asked Mr. Winn if he couldn't please con-

struct me rating curves, and he said, "No, I can't; the discharges in the stream go hay-wire." I realized at once that those large fluctuations were due to the power loads of the Buck and Byllesby plants. So now, as it was not practical by taking a single
1232 stream flow or discharge and accurately locate a point on some curve, I did the thing which any good engineer would do, or perhaps to explain it a little more effectively, like any good Battalion or Battery Commander in the Army would do if he was ordered to hit a target, and he knew his chances of hitting it with a single shot were not good. He would look up the probability of hitting the target. Let us say he found the probability of one shot hitting the target was only one in twenty. Then he would fire twenty shots to hit the target, and by all reasonable chances he would hit it. Well, in this case when I say that we could not get the curve by measuring these discharges with a single shot, I asked the Huntington office to plot a group of shots all up and down the lines we desired to measure; then draw a line to give the slope.

Now we have records of discharges on those dams on the river extending over a period from the time they were constructed until today, some ten or fifteen thousand, so we can plot all we want. I asked them to plot enough to locate reasonably accurately those curves.

Now after all the long discussions over these curves in this court, it is very fortunate the fluctuations created by the Buck and Byllesby project did cause me to adopt a method which would eliminate all possible error. This does. It eliminates the error due to variable heights in the dam below. It reduces possible errors which may be caused by the fluctuations of the Buck and Byllesby project, etc. So the slope which we obtain from those old dams is a very good curve. We had no rating curves for the new dams in the Huntington office. For each of the old dams we have curves which we know are very good. Above and below the new dams we know approximately where the slope of the curve would have to go.

Now the modification of the curve would be that due to
1233 making the new dam higher than the old so that you have what we might call a back water curve to the other curve and meeting it at some point on the slope. That is the curve we used in making the measurement. In order to get it as accurate as we reasonably could in some cases we plotted actual back water curves to the slope lines and in others we took observations of actual stream flow. So long as that line moves from the point, the zero point, of the curve, which is the height of the crest of the dam, to a point upon the slope curve, which we know is accurate, to a point about 20,000 or 30,000 c. f. s dis-

charge, it will make practically no difference in the result, the ultimate result we get, if the line be moved up any reasonable distance, or if it be moved down any reasonable distance. I invite the defense on my cross examination, if they feel that I do not get accurate measurements with this curve, to draw any reasonable line from the point representing zero at the crest of the dam to a point over on the slope curve somewhere around 20,000 to 30,000 c. f. s. and ask me what difference would it make in the results compared to the line you submitted. I assure you now it will make very little difference.

I will go further. I will permit them to make any reasonable adjustment in this basic slope curve. It will not materially change the results. I will not allow them to change the fixed height of the dam, because we know it won't be true.

By Mr. THOMPSON:

Q. I believe you said you had examined Exhibit 145, or, the 308 report, House Document #91, on the Improvement of Kanawha River and its Tributaries?

A. Yes, sir.

Q. Will you turn to that part which has to do with the Bluestone reservoir. By the way, who signed this report?

1234 A. It was signed by the Chief of Engineers. That section of the report was signed by Major General E. M. Markham.

Q. He is the present Chief of Engineers, isn't he?

A. Yes, sir.

Q. What will be the effect of waves produced, as you have described them, from the Radford project functioning as peak-load project in the event the Bluestone reservoir is built?

A. In case the Bluestone reservoir is built the peak-load wave of the Radford project would have the same effect on navigation on the New River between the Radford project and the Bluestone, which I have already explained, that is, it would reduce navigable depths to almost zero immediately below the project, and to only about one-half foot just above the upper end of the pool. It would fluctuate the upper end of the pool approximately ten feet.

Q. Ten feet?

A. Yes; it would virtually destroy any development of commerce from the pool of the Bluestone project to the river above.

Q. How much length would the pool of the Bluestone be, if you know?

A. It is shown on the profile, some thirty miles, you can get the correct figure right off the map here.

Q. Isn't it 36 miles?

A. Thirty miles is about correct, that is, the normal pool elevation. It is a little bit further than that, but not much, I think thirty would be the correct answer.

Q. State whether or not such a pool would provide water for navigation?

A. It would provide excellent water for deep-water
1235 navigation, for barge navigation, also for shallow draft boats like those which might want to go ahead and use the open channel portion of the river above.

Q. Colonel Watkins, assume that the Radford project is constructed and operating on the peak load basis, and having intermittent discharges, is there any way to correct that situation?

A. Yes.

Q. How?

A. The usual method employed in the issuing of permits for power projects under the Federal Power Act, is to require minimum discharge through dam or dam project equal to the minimum flow of stream, but it has been my experience that that is not satisfactory for the simple reason that in order to operate most economically, or get the most economic returns from hydroelectric projects, it should carry peak loads. And I have found it difficult to keep power projects down to it, to discharge the minimum low flow. They will go ahead and carry peak load and cut it off further because it means so much to them. So that, to get a simple means of absolutely eliminating this factor, I suggested in connection with the Tennessee report——

By Mr. JACKSON. I object to this testimony because it is not competent here.

Objection overruled. Defendant excepts.

A. (Continuing.) I will change that if you wish, and say as an engineer that I know all the troubles would be eliminated by the simple method of constructing a low head project below the large high project, using it for power and re-regulation of the stream flow, or in case the power companies do not desire that, to construct a temporary cheap dam with enough head to re-regu-
late the flow below their project. This would eliminate
1236 all difficulties caused by the peak load.

Q. Colonel, have you made any study of the waves created by the Buck and Byllesby projects, with New and Kanawha Rivers?

A. Yes, I have.

Q. What was the result?

A. I asked the U. S. Engineering office at Huntington to furnish me a chart upon which the gauge height at the various stages

along the river, from gauges above the Buck and Byllesby projects and all those below it, all the way to Kanawha Falls, and also of the Greenbrier and Gauley, as they proved when there was not a rain, causing the waves, and the result was that this chart showed very clearly——

By Mr. JACKSON: Are you testifying now about something that was told you by the District Engineer's office?

A. No, sir; I am testifying from information which he has furnished me which I presented or which has been presented in evidence here.

By Mr. THOMPSON:

Q. You mean by this chart here, Government Exhibit 141?

A. No, that is not it. It is a long roll which they have ready to present here, two long charts of 1930 and 1932. Here they are. These charts are Exhibits 113 and 114. Exhibit 113 which shows fluctuation in stream flow between July and August, 1932, also chart, Exhibit 114, which shows this same information for July and August, 1930.

Now these two charts are plotted, along the horizontal line, 1 inch represents half days beginning with the month of July and ending with August. The vertical line shows elevation in feet. Two inches equal one foot on the gauge. These two charts show fluctuations by stages. As it happens, on the upper river, a discharge of say 2,000 second-feet, makes a much larger change in the stage than the same discharge does on the lower river. So looking at the chart, at first glance, you may
1237 think that the persistency of the wave is almost ironed out.

So in order to illustrate that, they have prepared a third chart which shows horizontally plotted, the days of the week, and it shows vertically the discharges.

By Mr. JACKSON:

Q. Is that chart in evidence, Colonel?

A. Yes; that is Exhibit 115. These curves show conclusively, beyond any shadow of doubt, that during the years 1930 and 1932, the operations of the power plants at the Buck and Byllesby projects were fluctuating navigable depth in New River, way down the river and into the Kanawha River.

Q. Do they show how far down the Kanawha River?

A. No; because my last stage is at Kanawha Falls.

Q. What conclusions do you draw from this study of the special test of waves?

A. As I just stated, it did extend all the way down the river.

Q. That is your conclusion?

A. Yes, sir; normal operation.

By Mr. THOMPSON:

Q. Was this a special test of waves?

A. It is a test of waves created by normal operation of the plant during those two summers.

Q. That is, the Buck and Byllesby plants?

A. Yes.

Q. What capacity is it compared with the Radford plant, in storage?

A. It has the capacity in installations of the Buck plant, which is a small plant, and the capacity in pondage of both the Buck and the Byllesby plants, which may be utilized to help create waves. This is very small compared with the capacity of the Radford project for accumulating and ponding water over night, and Saturday and Sunday, and carrying the peak loads in the middle of the day in the week.

1238 Q. Colonel, what do you understand by channel storage?

A. The river has in it a natural channel—all rivers do more or less, channel storage capacity for the regulation and control of floods. When the rain falls and the discharge of the river is low, the river has not the capacity to carry off the flood water, without first taking the time to fill up the channel. When it reaches the high stage of 10 feet, it can carry a fairly large discharge, and when it reaches the stage of 20 feet, a still greater discharge, until finally the capacity is large enough to carry away the flood waters which arrive from above.

Q. Have you ever estimated the channel storage capacity of the Radford project?

A. In testimony given in the license for the Radford project to the commission of the State of Virginia, one of the officials of the project stated that the amount of river channel within the pool of the project was approximately 1,700 acres. From my study of the gauge heights along the river during maximum floods of record, and the line which I drew on account of my experience in working out flood heights for rivers, the average height of the maximum flood of record in the Radford pool was probably about 30 feet. Multiplying 1,700 acre-feet by 30 feet, we get 51,000 acre-feet. We know that the channel storage displaced by the pool of the Radford Reservoir was greater than that, for the simple reason that the channel widens as it extends higher, so that it is over 50,000 acre-feet.

By Mr. JACKSON:

Q. When you say "channel storage of Radford reservoir"—what do you mean?

1239 A. Channel flood storage, or storage used by the river in its natural condition in that channel.

Q. In that area?

A. Within the pool of the dam.

By Mr. THOMPSON:

Q. How much of this channel storage of the river would the Radford project destroy if it was filled up to its usuable storage line?

A. The results that I have just given you were for the channel storage used by the river in its natural condition, for the control of floods which would be filled up, or we might say eliminated by the pool of the dam when it is filled all the way up.

Q. So that your figure is approximately 54,000?

A. It is over 50,000 acre-feet.

Q. Have you made any study of the floods on the New and Kanawha Rivers?

A. Yes, I have made quite extensive studies of various floods on the New River.

Q. In your studies did you read what the 308 report said about floods, on these rivers?

A. Yes, sir.

Q. State whether or not the Kanawha and the New Rivers are in need of flood protection?

By Mr. JACKSON. I object to the question as irrelevant.

Objection overruled. Defendant excepts.

A. The 308 report indicates that there has been in the past about 10 feet higher floods than those recorded during the periods of record. My study also confirms the fact that there probably will be much higher floods than the maximum during the period of record.

The 308 report shows very clearly the destructive effect of
1240 floods and calls special attention to the maximum flood of record on the lower river, that is the 1861 flood, which was very destructive, at a time when the Valley was not developed as much as it is now.

Q. Assume that the construction of the Bluestone reservoir is completed—will not that take care of the flood conditions in the upper New River and below it?

A. No.

Q. Why not?

A. It is not of sufficient capacity to stop maximum floods. It can only eliminate a certain amount of their peak. The main body of water will continue on past the Bluestone Dam.

Q. Assume the Radford project constructed and filled up to its useable storage and a flood came down the river, what would have to happen there with respect to the operation of the project?

A. If we assume that the Radford project be constructed as shown in the plan submitted by the applicant, and operated as

described by their representative before the Power Commission of Virginia, the Radford Project would increase the height of flood on the New River below the project and even down to and in the Kanawha, and in the Ohio, below the mouth of Kanawha River.

Q. Would not these dams down below have some protection so far as flood conditions are concerned—I mean these Government dams, wouldn't they break up floods or hold them back?

A. No.

Q. Why not?

A. For the simple reason that they cannot hold out water to eliminate or alter the shape of the flood.

Q. Do I understand you to say if channel storage is filled by a pool which is more or less stationary, or intended to be as near stationary as possible, that the flood condition will be
1241 more serious under the conditions of that kind than if you did not have reservoirs in the river?

A. Yes. May I explain two situations?

Q. Yes, go ahead.

A. Ordinarily power companies operate their project, even reservoir projects, at as near what thay call normal pool elevation as possible. If a flood comes along they endeavor to maintain pool elevation up to normal pool height.

Another situation is that explained by a representative of the company during application for permit, that it may be drawn down as flood approaches and then catch some storage later. In the first place, if they attempt to operate pools at normal fixed elevation, it will increase the height of floods immediately below.

Q. How is that?

A. For the simple reason that the river in its natural condition had to fill up its flood channel before the flood waters could pass through 21-mile length of the pool of the dam. When the dam is built the pool of the dam is already filled up, or has already filled up that portion of the channel except a very small portion in the upper end.

Its flood gates in the dam have a capacity ready to discharge the water equal to that of the maximum possible flood. It can do that at any minute. As soon as the small portion of the natural flood channel in the upper end of the pool is filled up, which requires very little time, compared with that of filling up the entire 21 miles of natural flood channel, the whole body of water within the pool of the dam is ready to move down just like a train pulling out of a station.

The rate at which it moves down will be that of wave action of 20 to 40, to 60 miles an hour. It is hard for some people to see
1242 that, yet I know it is true. Even when we do not include

wave action and consider only the fact that it takes only a short time to fill the rest of the flood channel in the upper end of the pool, when the whole mass of water in the pool is ready to move, we understand that the time is very short.

Now as I have already explained, if they are operating and must maintain the pool at a fixed elevation when the water starts moving, they have got to open those gates and let it down, if they don't it will rise up and up and up, and overflow the dam. They must let it out.

Now the river is ready to discharge at the upper end just as fast as the water comes and the gates must let it out at the lower end, so the time of passage of flood through the pool or dam will be shorter after the dam was built than it was before the dam was built. Now if the time of passage is shorter, any one should be able to understand that it has got to go higher.

Q. Suppose in order to meet this storm they let the pool down or let the water out, what happens?

A. All right. In that case, if they drew down as the flood approaches, they could catch some of the water at the peak and prevent the flood from being so high immediately below the dam, which would be a benefit to the Radford project. But, by advancing the flood by opening of gates to draw it down as the flood approaches, they advance a quantity of water, much greater than when operating at normal pool. They have advanced the center of gravity of the mass of the flood, with the result that as the bulk of water in the flood goes downstream and is combined with waters flowing in from all of the lower tributaries, the height of the flood below will be not only that equal to the increased height—caused by the displacement of the natural flood channel storage in the pool of the reservoir, but also that due to advancing the cen-
1243 ter of gravity of the body of the flood. It would, therefore, cause flood height on the lower river even greater than that of operating at normal pool elevation.

Q. Is there any remedy for that?

A. Yes, if the Radford project provided for reserve flood storage, equal to the amount of water in the natural flood channel of the river displaced by its pools, it could not only avoid increasing floods below, but it could greatly reduce floods below just that much.

By the COURT:

Q. Is there any reserve at the Bluestone dam?

A. Yes, a much greater amount.

By Mr. THOMPSON:

Q. Does the Bluestone sur-charge cover the amount of capacity that will be displaced by channel storage at Bluestone?

A. Yes, sir, it is much greater than the flood storage displaced by the pool of the Bluestone Dam, and it therefore, has a much greater capacity for controlling floods.

By Mr. THOMPSON:

Q. Referring to the Bluestone Reservoir, I believe you testified that it had a large sur-charge for flood conditions, but that it was not sufficient to take care of watershed above it. Is that correct?

A. It is correct. It could hold out only a small part of the volume of our major floods.

Q. What effect would the Radford project, in the event of high water or floods, have upon Bluestone?

A. The Radford project would increase floods below Bluestone, in other words, the advance of the volume of water caused by the Radford project will go right on past the Bluestone project as though it were not there, during major floods.

1244 Q. By "major floods" you mean what type of flood?

A. Oh, floods——

Q. (Interrupting.) What years?

A. The year of major floods, or I call them major floods, those like the 1916 flood and higher.

Q. Assuming conditions such as they were—did you hear Mr. Pierce testify here?

A. I hea'd some of his testimony.

Q. In regard to stream flow. Let me ask you this. On what plan is the Bluestone project to be constructed so far as minimum discharge is concerned?

A. As I recall, the Bluestone project, without the assistance of increase in low flow which the Radford project may give, is prepared to give a minimum low flow, or continuous low flow discharge of 2,000 cubic feet per second.

Q. Assuming that the Radford project is cut off for a period of say ten days, so that the flow is not coming down the river, or a longer period than that, what effect will it have on the discharge of Bluestone down the river, if any?

A. The Bluestone project could not maintain a minimum low flow of 2,000 cubic feet per second as proposed. If the Radford project cuts off this flow at a time when the stage in the Bluestone project is low, it may cause a great reduction in the discharge of the Bluestone below 2,000 cubic feet per second. In any event the Bluestone cannot count upon maintaining the proposed 2,000 cubic feet per second, if the Radford project is allowed to cut off the flow of the stream above for a considerable period of time. I say that because the operator of the reservoir in utilizing its storage for increasing low flow goes back over all flows of record,

and he plots a mass curve or a mass table showing the accumulated volume throughout the period of record. He then draws a
1245 line which shows the amount of water which the reservoir should discharge at any time, and the maximum rate it can discharge during low flow periods.

That is based upon expectancy that the river will flow in the future as it has flown in the past. If you can obtain a long enough period of record, you can most assuredly prepare a rule curve by means of which you will be able to maintain a minimum flow of 2,000 cubic feet per second. If, however, there is a project above, which is permitted a cut off of the stream flow at any time, and especially a project like the Radford project, with its unusual layout, which I have already explained, the stream flow which the Bluestone project could count upon as indicated by the rule curve, would not arrive and the Bluestone project could not, therefore, go ahead and maintain its minimum low flow of 2,000 cubic feet per second.

Q. Mr. Pierce has testified here that the flow at the Radford dam site was 760 feet on a certain date, that the flow on the same date at Kanawha Falls was 1130 cubic feet. Now, assuming conditions with respect to the dams in the Kanawha River to be the same as they were on June 1st, 1927, with a six-foot navigation project, and assuming that the Radford project is cut off for a period of four or five days, what effect would this have on navigation in the Kanawha River?

By Mr. JACKSON. I object to the question because any answer the witness might give would be irrelevant and immaterial. He is asking about conditions that prevailed in 1927. The Court is not asked for an injunction under conditions prevailing in 1927, but under conditions that prevail now, or will prevail in the future, and which conditions can only be determined when the project is completed.

By the COURT. Read the question. (Question read.)

By Mr. JACKSON. I object further to the question because there is no basis in the testimony for the assumption that the Radford project flow would be cut off for four or five days.

By Mr. THOMPSON. What I am trying to bring out here is as to the action of the commission on June 1, 1927, which is in issue, whether they acted lawfully or with judgment or with care and I am asking the witness to assume conditions that existed at that time, in other words, here was a river at that time which did not have these new projects in, the London and Marmet dams, and I am taking the stream flow such as occurred in 1930, and the idea being if such a condition had existed——

By the COURT. You said in 1930.

By Mr. THOMPSON. Yes, sir.

By the COURT. I thought it was 1927.

By Mr. THOMPSON. I say the flow of the stream such as existed in 1930, the low flow condition, and I am asking about those conditions in the river as of June 1, 1927.

By the COURT. Assuming those conditions, you are asking what are the conditions whenever they existed.

By Mr. THOMPSON. All right, I will strike out June 1, 1927.

By the COURT. Should not the question be as to the conditions whenever they existed?

By Mr. THOMPSON. Yes.

By the COURT. I think he can answer that.

Defendant excepts.

A. By mental computation, 760 from 1130 leaves 370 cubic feet per second. If the Radford project cut off 760 feet per second during the period of low flow, as you explained, the remaining low flow on the river below at Kanawha Falls would be—would only be 370 cubic feet per second. If that had occurred at any time during the period or before 1927 or after 1927.

By Mr. JACKSON:

Q. How much after?

1246 A. Now—right today—or 1930, it would have reduced the supply of water to less—decidedly less—than that necessary to maintain the elevation of the water in the pools to the crest of the dams. The water would, therefore, be lowered in the pools.

By Mr. THOMPSON:

Q. What effect would that have on the upper ends of the pools at the present time in the Kanawha, so far as navigation is concerned?

A. Of the new dams?

Q. Yes. Assuming the new dams to be there?

A. Assuming the new dams to be there and cut off 760 cubic feet per second during low flow may be measured on those rating curves which I have constructed for the upper end of the pools of the dam. I believe at that stage the difference in the navigable stage would be only about .1 to .2 of a foot.

Q. What effect would that have on the back end of the pools?

A. I am giving you this for the back end of the pools—it would have reduced the navigable depth, which means navigable capacity, by that amount. The cutting off of the flow by the Radford reservoir, however, I may explain is not limited to those low flows. It may cut off the flow at any stage. If this stage happens to be about that of the average annual flow at the Radford project, which is 3,300 cubic feet per second, that on the lower river is then 12,000 cubic feet per second, it would cause fluctuation of stage in the upper end of the pools of about .4 of a foot.

Q. Now, what—in that last question, were you reducing from a certain flow to a certain flow?

A. As I have explained the Radford project. On account of the unusual layout, this project will act as a regulating power
1247 project. It is not interested in maintaining a uniform flow at the Radford project. It is interested in maintaining a flow to secure a maximum uniform power for the entire system, so whenever there is an increase in flow, or a reduction in flow, at any one of its group of projects, it must go up or down in order to keep up that maximum uniform rate for the system.

1248 Q. Colonel Watkins, House Document No. 91, for 308 Report, states on page 2, paragraph 6: "The larger tributaries of the Kanawha are susceptible of improvement for navigation by the utilization of the pools formed by the construction of high dams for power and flood control purposes, if locks or other devices are constructed for passing vessels from one pool to another. The large cost of providing and operating such locks and other devices does not appear to be justified by any commerce immediately in prospect, and no general plans are now presented for the utilization of those tributaries as routes for modern barge navigation." Do studies made by you indicate that the New River may be economically developed for 9-foot navigation at some future date?

By Mr. JACKSON. We object to the question. He is reading a statement to the witness on direct examination and is not cross-examining him. I object to the form of the question.

By Mr. THOMPSON. What I read and quoted to the witness was from House Document 91, as to Report 308.

By the COURT. Your question apparently anticipated that you wanted an answer contrary to the report.

By Mr. JACKSON. We also object, because they are trying to impeach their own evidence.

The Court overruled the objection and the defendant, by counsel, EXCEPTED to the ruling of the Court for reasons stated.

A. Yes, sir; my studies indicate that, as power is developed in the system, each pool may be used for navigation, as each dam is built.

By the COURT:

Q. That would be true of any dam on any river anywhere, would it not?

A. Yes, sir; that is true. As more dams are built, it would soon become possible to connect them up for a longer connected waterway. Now, my studies indicate that practically all of the whole system of projects on the New River and some of its

tributaries, will be economically feasible, and most of them very desirable plants, provided the key projects shown in the 308 report—that is, the reservoir projects, are developed. If that be done, the locks for the dams may be readily put in as soon as there is sufficient demand for navigation to compensate for their cost. And where there are gaps in the lines, there may even be great enough demand for navigation alone to put in some of the dams, or by some arrangement to provide for cooperating power within in constructing a series of dams in common.

Also those dams for navigation may come as an answer to meet
the demands for local movements within New River or for
1249 movements of commerce from the New River to the Ohio
River system, or from the Ohio River system back to the New River, or for a train shipment from any point on the New River to any point in the United States or it may come as a demand for a through waterway from the Ohio River to the Atlantic seaboard—either through the Kanawha River or perhaps over the Tennessee River and other sources. The rate for this—the rate that you may expect for such a development is, therefore, dependent to a great extent upon whether there is a demand for power which will justify the development of the power projects.

By the COURT:

Q. Why is naviation—if I understand, the development of power is a mere incident to the development for navigation purposes?

A. Yes, sir.

Q. Assuming that the Federal Government had no right to go into the power business, as such?

A. Yes, sir.

Q. But, having built dams for navigation purposes, Have you been through the New River gorge?

A. Yes, sir.

Q. Do you think it is economically sound—an economically sound proposition to say that New River gorge is a navigable stream?

A. My studies show clearly that it may be readily developed for navigation by a series of reasonably high dams; that if there is a demand for navigation between the New River, or for through navigation—like that from the Kanawha and the James River to the Atlantic Seaboard, it would be an excellent navigable waterway. I mean just that—it would be excellent.

Q. If I understood Mr. Thompson's question, he asked you whether or not it was practicable and would be justified?

A. Yes, sir.

Q. From an economical standpoint, to develop New River as a navigable stream?

A. Yes, sir.

1250 Q. You think it would be?

A. Yes, sir. It depends solely on the amount of commerce that the demand would supply and upon the length which that commerce is hauled. In other words, the estimates must show enough commerce to justify the interest on the investment that the Government makes in building a dam; and an amount sufficient to enable the Government to operate and maintain these locks. You see what I meant. We build no projects—the Corps of Engineers never recommends any navigation projects to Congress, unless, at the time it recommends it, it can see a justification for it by returns to the public in the way of navigation to justify interest on the investment that the Government puts into it—the amorization of the money and the operation of the locks and the maintenance of the locks. In other words, it is just a business proposition. We never recommend it——

Q. And it is your opinion, from your knowledge and the commercial development of the country generally, and your knowledge of the area over which the New River flows, the production there that might be the subject of commerce, that there is sufficient prospect to justify the very large outlay necessary to make New River navigable throughout its length?

A. I say that without hesitation.

Q. As a business proposition?

A. Yes, sir; as a business proposition.

By Mr. THOMPSON. He has a right to take into consideration flood control and other useful purposes.

By the COURT. I am getting to your question. I think your question was based on navigation.

By Mr. JACKSON. May I now move to strike out all of the testimony of this witness dealing with the possibility of creating navigability for New River and the possibility of future commerce, both as being immaterial, irrelevant, and incompetent, and entirely speculative so far as future commerce is concerned?

By the COURT. I asked the question myself and I do not believe I will strike it out.

To which action of the Court in refusing to strike said evidence, the defendant, by counsel, excepted, for reasons stated.

By the WITNESS. I say without hesitation, in the future, when the demand for power becomes great enough to justify their development, and dams are put in, or perhaps suppose there are some gaps in there not put in—the Government would unquestionably be justified in constructing locks to help cut in the dams

for a water-way, like the through water-way by way of the James to the Atlantic seaboard.

Q. Supposing none of these dams were utilized for the
1251 development of electric power and it was forbidden that any dam in the New River should generate power, do you think construction of the dams themselves on that condition—eliminating and making it impossible to produce or use electric power, would be justified in the interest of navigation?

A. Not at the present date. I haven't gone into the subject thoroughly enough to make a definite answer and an answer to that requires a field study to determine the exact cost. My estimate has been an estimate made as carefully as I could, considering the slope of the river—the character of the sites—the height of the dams—the material in the dams, the railways affected—the amount where you have to remove them out of the way—of little communities to be removed. They did take into consideration those physical factors which will be involved. You may have to change the location of the site.

Q. You also took into consideration the commerce that will utilize it?

A. Yes, sir; also the factor on the other hand as to the amount of commerce, because if it is to be only a certain amount, then you are justified, and if a greater amount, you are justified in a greater cost. If you get back enough of it, it would justify the cost. I do not know that we have that amount today or when it will become that amount in the future or how long it would be. But the Government is confronted with this situation, as I see it—if it built the dam for navigation, it can just as readily be let out for power, so that in fact you have two economical developments which are both developed on the river. You see the idea!

Now, we know that there is demand for power. We know that it is coming along, just like the demand for navigation. I do not think either should have to do all on the common dam used by both—used by both is a better expression, but I know
1252 it is to the public interest to have them both, and that——

By Mr. THOMPSON:

Q. Do studies made by you indicate that the New River may be economically developed for 9-foot navigation at some future date?

By Mr. THOMPSON (continuing). That will include the time when there was commerce which was really sufficient to make it look worth while as a project and the thought of amortization by the creation of power.

By the COURT. I suppose nearly any stream in the world, if the banks are high enough for the erection of dams, could be made navigable by a succession of dams and locks. Is that true?

A. To my mind, I think it is very simple. I have gone over and described the physical characteristics of this stream. It is wide and the channel is straight. It is just the kind of a stream that would make a good water-way. While it would have to have more dams than a flat stream, it is straighter than most streams. The flatter a stream, the more crooked it is. This is straight. I do not think the increase in dams would cause much delay in time. It would be a deep water-way and would carry nine foot barges, like the Ohio and the Mississippi.

Q. In a mountain stream—the ordinary trout stream between mountain hollows, if you had demand enough, you could make that navigable, couldn't you?

A. Let me explain this. You take a small stream, the physical characteristics of which I have explained; they are not satisfactory for a water-way. The river is not wide enough—the channel is not straight—the supply of water is not good and all of these features have to come in. When you get to a water-way that is small, it would be eliminated on those grounds; and it was the physical characteristics that I looked at to justify what I have in mind as navigable water-ways, in the United States and in Europe—in France and Germany and even in Oriental China. I compared in my mind the sizes and the physical characteristics of waterways, and I may say that, if this water-way were in France or in Germany or in oriental China, there would be no doubt but that it would be carrying a large volume of freight.

By the COURT:

Q. I am not comparing streams, but I am asking you this, if you spent enough money, you could make most any stream navigable?

A. If you spent enough money, yes, sir. My answer was
1253 based on Section 3, of the Federal Water Power Act—giving you the engineer's features for answering that way. If it hasn't got the physical properties and characteristics that that calls for, then it is not a navigable waterway. If it has, it is navigable. You see the idea.

By Mr. THOMPSON:

Q. Mr. Watkins, will you state whether or not in your opinion, New River is susceptible of navigation in its natural state?

A. It has been used—It has been used for navigation in the past and if the artificial obstructions and interference be removed, it could be utilized today; I say especially for the transportation of loose logs—loose logging and rafting, which can be transported on the waterway more economically than by any other known means. It could be used for shallow draft boats. It can—steamboats or power boats and barges, drawing 3½ or 4 feet, can unquestionably operate satisfactorily in the pools.

As I explained, I am convinced that, during the stages of good water, which means that above low flow, when the shoals, except the bad ones, become eliminated, boats could unquestionably move up and down sections of the river if the channel were marked out and boulders in the channels were removed to eliminate the danger of striking concealed boulders. At the worst places, the barges would have to be passed by—what I consider is covered by the term of "portage," until they are improved and facilities are made for passage. That is the way I look at it.

By the COURT:

Q. In your dream of commerce on New River, you do not picture it in a natural stage, but when there is a succession of dams built and locks and they are going from one lock to another?

A. If the Court would allow me to tell you about others—about other rivers, I could make it clear to you in a second, but you will not allow me to make comparisons.

Q. Yes, go ahead.

1254 A. Well, now, the most of the shoals on this river are no worse than a number or many, I will say, on the Tennessee River.

By Mr. JACKSON. I move to strike that answer.

By the COURT. I asked him for it. The motion is overruled.

By Mr. JACKSON. In order to keep the record straight, we will except to the ruling of the Court.

A. None of them except the two worst places—the gorge section for 25 miles above the mouth of Gauley River, and the 15 mile section above Ivanhoe—none of them except those two sections, are as bad as used to be the old Muscle Shoals section of the Tennessee River or the Riverton section of the Tennessee or the Old Gorge section that now covers or is covered by Hales Bar Falls.

By the COURT:

Q. What I want to know is this—Mr. Thompson asked you about improving the conditions of the river to make it navigable?

A. Yes, sir.

Q. In response, you pictured its possibility as an open waterway to the Atlantic Ocean?

A. Yes, sir.

Q. And dams and pools and locks?

A. Yes, sir.

Q. Your next view was in its present condition. Were you considering the navigability of New River from an economical standpoint—from the standpoint, I mean, of a business proposition?

A. Yes, sir.

Q. How did you picture it—its present condition or as a stream upon which locks and dams have been built, making pools of substantial draught and moving or carrying vessels by moving them from one pool to another—pool or lock?

A. I considered it in both, Your Honor, both its possibilities today and what it has been and its possibilities today and in the past and in the future, both for the amount of traffic it might use upon the river for navigation. This river in its natural condition or in an improved condition or water-ways like the Government is trying to build today. It has spent most of its
1255 money on the 9 foot navigation waterways and none on the small. It has since 1900 not spent much to help the man with the shallow draught boat on open rivers. It is due, primarily, as a matter of fact, to economics. While the movement of loose logging is very economical and rafting is very economical and this is a great saving to the man shipping it and the man receiving it, and while the movement of freight in the shallow draught boat is a great help to the particular individual that it handling it, the sum total of demand for commerce is not great enough to justify the expenditure to greatly improve the river. You see my point. If the Government will go and put money in a thing, you must get enough commerce to justify the expense. Now, the waterway may be 100 feet deep and they may want an obstruction removed across it. The prospective commerce may be only 100 tons per year and it may cost a lot to remove the obstacle to provide a passage in a water-way 100 feet deep that would be navigable. It has all the physical characteristics, except a slight obstruction, which could be removed.

Continuing on with the economy questions, our water-ways in the old days had practically no greater navigable depth at low flow than has New River now. You did not let me finish about the Tennessee River. I was going to give you the navigable depth there. They are all that way. Of course, you get big rivers like the Ohio, and you hit a few where the navigable depth was less, in its natural condition—less than two or three feet. Whereas, there are other water-ways, like the Tennessee, there are a number of shoals in the upper 400 miles, where the navigable depth was not over 1 or 1.3 feet. I can give them to you, if you wish.

By Mr. JACKSON. We move to strike the testimony of this witness where it purports to show natural and other conditions of the various rivers of the United States.

By the COURT. The motion is overruled. I developed it myself. I will let it stay.

To which action of the Court the defendant excepted.

1256 Cross examination by Mr. JACKSON:

Q. Colonel Watkins, in the course of your direct examination you made some reference to fluctuations at the upper end of the Bluestone pool on the hypothesis of the construction of the Bluestone project and the operation of the Radford project on a peak load basis. What did you say the fluctuation would be?

A. My estimate on the fluctuation was based upon the increase in gauge height which would be caused at Glen Lyn.

Q. I first want to know how much you said it would be.

A. About ten feet at the upper end of the Bluestone pool.

Q. Upon what assumptions did you base your conclusion that there would be a fluctuation of ten feet at the upper end of the Bluestone pool under the conditions stated?

A. If you will take the U. S. G. S. rating curve at Glen Lyn which is approximately the upper end of the pool of Bluestone after it is constructed, that is the normal fluctuation, the fluctuation in the stream flow on that gauge amounts to about five feet. Look it up.

Q. That is the total fluctuation?

A. Yes; for a wave it would amount to about 8,000 cubic feet per second, I believe. You can check the exact amount right on the rating curve.

Q. Let me see if I understand you. You mean that the daily fluctuation on the Glen Lyn gauge is five feet?

1257 A. The fluctuation for a peak load wave of 8,000–9,000 leaving Radford and I estimated about 8,000 when it gets to Glen Lyn (it may be a little more or a little less), would be about five feet on the curve, if I am not mistaken. We can look right on the curve and get it.

Q. That is an estimate which you have made?

A. Just a rough estimate.

Q. You don't mean to testify that you read any fluctuations of such magnitude off the gauge at Glen Lyn?

A. Well, I might say this for Glen Lyn and for all of these other rating curves. They have been constructed by the United States Geological Survey. I have had a great deal of service in connection with the United States Geological Survey. On the Lake Erie-Lake Michigan Waterway, I personally, and with a number of engineers, laid out and constructed and operated and measured the stream flow and computed the water supply for a large number of gauging stations. On the survey of the Tennessee River, the United States Geological Survey District Engineer who was in charge of computing the stations at that place ran out of funds. I supplied him with funds from my own allotment. I gave him a seat in my office. I worked with him on those surveys. I took his discharges and I used them. I used them as a good engineer

like the Geological Survey did when he computed his rating. In order to get them accurately he shot a whole lot of points all up and down the line and he drew a line through them. So having seen those points right on his curve there as he plotted them, well, they are good enough for me.

By Mr. JACKSON. I move to strike out the answer as not responsive and ask to have the question read to the witness.

Q. (The question was read.) Answer my question as to whether you did read fluctuations of that magnitude off of the gauge records at Glen Lyn?

1258 A. I do not exactly understand your question.

Q. You know what a gauge record is, of course?

A. No.

Q. Do you know what a record of an automatic recording gauge is?

A. Yes.

Q. Is there one at Glen Lyn?

A. I think the Geological Survey has an automatic gauge record there.

Q. Did you find any such fluctuation of the order of magnitude described by you shown upon any record of the automatic recording gauge at Glen Lyn?

A. I saw it on the rating curve.

Q. You understand my question, Colonel?

A. Well, now, listen—the rating curve is the official final recorded data from these automatic gauges.

Q. Please answer my question. Did you see any fluctuation of the order of magnitude described by you upon any record of the automatic recording gauge at Glen Lyn?

A. No.

Q. Then this fluctuation in gauge height at Glen Lyn was an estimated fluctuation, was it not?

A. It depends upon the meaning which you give to "estimated". It was based upon reading of the rating curve for Glen Lyn which had been constructed by the Geological Survey and is reliable enough for these purposes.

Q. But it was not an observed fluctuation?

A. No; it was not observed. It couldn't possibly be because it hasn't been there yet, but it will be at some future date.

Q. What are the assumptions upon which you estimated a ten-foot fluctuation in the upper end of the proposed Bluestone reservoir?

1259 A. My estimate of the ten-feet fluctuation in the upper end of the pool of Bluestone project is based upon the fact that an 8,000 cubic feet per second wave such as those created by peak loads from the Radford project, when it reached that point

it would cause the upper end of the pool to rise to an elevation of approximately five feet above the horizontal, that is the point of rest, as I have explained, I think, quite clearly in this chart showing the fluctuation of the water in the upper end of the pools of the Kanawha. You would have a similar result in the upper end of the pool of the Bluestone. In other words, the wave as it approaches would cause the upper end of the Bluestone reservoir to be tipped up or suspended five feet.

Q. Raised five feet?

A. It would be tipped up and held five feet above the horizontal point of rest. Then as the discharge is cut off by the tail end of the wave as it comes in, the gravity of that water five feet above the point of rest, plus the momentum of the water, the whole body of water of the Bluestone reservoir, moving down stream would cause the water in the Bluestone reservoir to fall not only to the horizontal but to five feet below horizontal.

X Q. Well, now where was the 8,000 second-feet measured or assumed?

A. The difference between the trough of the wave and crest of the wave just below the Radford project would be approximately equal to the maximum hydraulic capacity of your installation, that is 9,000 cubic feet per second.

X Q. You are talking now about the size of the wave immediately below the dam?

A. Immediately below the Radford project. That wave would travel downstream. Insomuch as the load curve, the daily
1260 load curve of the Appalachian Electric Power Company is in virtually the same shape as that of the characteristic wave of the New River, it is only reasonable to assume that it would travel down river with very little dissipation, because none would be lost, shaping and molding the wave, that would be the same; so my rough estimate, without going into it and computing it would be, I would say, be reduced from 9,000 to let us say about 8,000, when it got to the upper end of the Bluestone pool.

X Q. What do you mean by the characteristic wave of New River?

A. The characteristic wave of New River is a wave of a shape caused by the various elements in the channel which permit it to flow fast or slow, or otherwise; for example, the characteristic wave in the New River has a sharp rise, it goes to a fairly sharp peak and it has quite a sharp fall.

X Q. How is a characteristic wave in New River produced?

A. By the various physical characteristics of the channel. The most important of which are the slope of the stream and the lack of large amounts of channel storage.

XQ. Have you any graphical record of what you call the characteristic wave of New River?

A. I have plotted various floods on the New River, the height of them, plotted them from discharges, and there are a large number, are in the Water Supply papers. I was furnished copies of hydrographs by the U. S. District Engineer office at Huntington, and I think I am quite familiar with the characteristic wave of New River.

XQ. And you assumed there would be no dampening out of the wave between the time when it was assumed to leave the Radford plant and its arrival at the upper end of the Bluestone project?

A. I assumed there would be very little loss, for the simple
1261 reason the typical load wave of the Applachian Electric Power Company is very near the same shape as the typical wave on the New River, so there should be very little loss in the total volume of the wave as it goes down stream.

XQ. In other words, you are testifying that the waves do not dampen out, is that right?

A. They do not dampen out very much. It depends of course upon the shape you release the wave, probably it is going to dampen out approximately the same shape as that of the characteristic wave of the stream, a certain amount will be lost until it gets that shape, then it will carry on.

XQ. And you computed what you call the characteristic wave of New River from the data you found on floods, is that right?

A. I have drawn a picture of it in my mind, from the large number of waves, flood waves, or what ever kind of waves you want to call them.

XQ. Can you give us that picture now?

A. As I have already described it, it is a wave which goes up with quite a steep slope and reaches a peak, a fairly sharp peak, and then it has quite a steep fall. Is that clear?

XQ. What is the relative slope on each side of the wave, just give the rate of slope on the front?

A. I can express it for you this way——

XQ. If you can give the rate of slope it will probably be better, I can understand it better than otherwise probably.

A. Well, I am not quite a good enough engineer yet to sit here and describe to you whether it would be a ten degree slope on the vertical or fifteen degrees, because you know there is such a thing as an optical delusion; in other words, we know we look at a match this way and then this way, and it will appear to be different lengths. If I had an instrument and had the curve drawn, I probably could give you a fairly good estimate, but after all, if we wish to know what it is, let us go to the records

and plat one, and see, because they are there and we can get them.

1262 X Q. In other words, this picture that is in your mind of the wave is not clear enough for you to pick off of it, or read off of it for me the slope of the front of the wave?

A. I could make estimates, but they are subject of course to actually getting the thing and drawing it. I have a picture in my mind, it may go up at the rate of about fifteen degrees from the vertical or ten degrees from the vertical up to peak, and then down to a somewhat lesser one.

X Q. How long have you been working on this subject, I mean on New River?

A. I was ordered to report to the Attorney General in the summer of 1935, about a year.

X Q. You have been working on it ever since?

A. Yes, sir; spent a great deal of time on it.

X Q. I take it from what you have told me you can't give me the slope of the back of the wave either?

A. Well, as I have told you in my own mind I have a picture of it, but it is difficult to give accurate figures. I could draw one if you would give me a piece of paper, but roughly let us say somewhere around ten or fifteen degrees.

Q. Ten or fifteen degrees?

A. From the vertical.

X Q. The slope from the back of the wave?

A. Yes, sir; these are subject to actually drawing them down and measuring them with a rule.

X Q. Now the slope of the front of the wave would be the same?

A. Something of that same nature, it may be a little larger.

X Q. A little larger, you mean a little steeper?

A. Yes, it depends somewhat on the volume of the wave.

X Q. And that means it is less departure from the verti-

1263 cal on the front of the wave than the back?

A. Yes, the larger the volume of the wave the steeper you may find that slope. It depends on a number of things. As the wave became higher it would be larger and steeper.

X Q. What rate in change of power load did you assume?

A. You mean between the maximum and minimum?

X Q. I mean the rate of change?

A. It was a curve of the rate of change about like a characteristic curve of New River.

X Q. Have you in mind the exhibit of so-called load curves offered by Mr. Kramer?

A. No; I don't know the exhibit he offered.

X Q. Can you see that chart, Exhibit #142?

A. Yes, sir.

X Q. Now that power load in point of time that chart reads from left to right, doesn't it?

A. Yes, sir.

X Q. Is that the sort of curve you assumed?

A. We will note that curve looks quite flat, as you look at it, because the lowest part of the curve is only a little above 100,000, where the upper part is about 250,000, and the period of time covered by the whole base of the curve is only from about 4:30 in the morning until about 12:00 at night, in other words, you have only a portion of the day.

Now we will look further, and we see up there at the point about 2:00 or 2:30 or 3:00 you make a big drop. Now I don't believe you will always have that high bulk you have on that wave. You may or may not. It is going to pop down sometimes, and at times you will have a wave actually lower than that, you will have waves that will pop up around 300,000 and it may be sharper than that, sometimes you have a couple of little peaks, it won't always be the same, but in the same general shape as the curve characteristic of New River.

Q. Directing your attention again to that upper curve on Exhibit #142 am I right in reading that curve as having
1264 a much flatter slope in front than at the back?

A. It is steeper, in front than what I would call the back. That is, the later period of time. But you are not going to always have that little peak over there. I mean that little fat part over on that end. You will have quite a bit because you have quite a nice night load. Sometimes it will be higher in the middle. Now you are coming to what I am driving at, the general conformity of your curve will conform closely to the general conformity of New River.

X Q. Have you any information about the future load of the Appalachian Electric Power Company that is not available to the defendant?

A. I will tell you this. May I express it this way—— when I came on to this study I asked the engineer of the Power Commission for a peak load of your characteristic load. Well, he didn't get it for me. I went ahead and worked out all the factors of this problem from my knowledge of the kind of loads that power companies carry, loads for use in the public service, and I am here to state right now I did not get those characteristic load curves until about two weeks ago, and I have not changed one figure.

X Q. I don't doubt that, but you don't question the accuracy of the load curve that was presented by Mr. Kramer, Exhibit #142, do you?

A. We have a number of curves, they won't always be the same shape as this one.

X Q. You think Mr. Kramer didn't present a typical load curve, in his testimony?

A. If you will look over the load curves of your company, they are available to you, and I doubt if you will get any two of those curves exactly the same shape, but every one will have more or less the same characteristics.

1265 X Q. Everyone will be the shape of this characteristic curve of New River that is in your mind?

A. I said the same general shape.

X Q. What sort of peak load operation did you assume?

A. Well, from my knowledge of the operation of power projects, I worked up the volume of the load which you could discharge for various stream flows. I took your low regulated flow of 1230 cubic feet per second and went on up to the average annual flow, and I worked out the volume you have on that curve, and considered the manner in which it would be discharged. Your loads are going to vary, you are not going to put them out just the same, but you will do what I say you will, put it out in a general mass or shape or form somewhat like the natural hydrograph of the river.

X Q. I want to ask about another matter. Referring back to your testimony about the oscillation, at the upper end of the pool at Bluestone, or at Glen Lyn as you described it, will the extent of the oscillation below pool level at Glen Lyn or the upper end of Bluestone be in any way dependent on the rate of increase in water levels due to the incoming waves as measured at Glen Lyn or the head of the pool?

A. No; for the simple reason that that power which tips the pool of the Bluestone project above the point of rest, above the point of horizontal, that physical power holds it up there and it would stay there until doomsday if you didn't stop sending the water down the river. It would stand there forever. But it has got in it at all times those two old potential powers, that is the power of the head above the point of rest and the power of momentum of that volume of water flowing down, and the minute you cut that flow off and don't keep it going the way you have got it there, if you quit, it will go right on down.

X Q. In your judgment would it make any difference 1266 whether the five foot rise occurred in one minute or two hours?

A. It wouldn't make any difference in the amount of rise.

X Q. Not the slightest difference?

A. It might make it go down a little farther because it would be flowing faster.

X Q. But your opinion is the oscillation you have described would be as free if the increase came in twelve hours as though it came in one minute?

A. Hardly one minute, for the simple reason I gave you, those two factors.

X Q. Call it five minutes then.

A. It is physically impossible for you to go ahead and tip that reservoir six feet in the upper end, in five minutes, so you are asking something against the law of nature, you would have to shoot a great amount of water and then—[witness indicated]—booie.

X Q. Give it five minutes.

A. Five minutes can't do it.

X Q. How long would it take?

A. Well, you are asking me to compute something which you can take a piece of paper, you are a good engineer, you could compute it. Any normal increase you get will not affect your problem. If I must I will take a piece of paper and figure out something.

X Q. Will you, just as we adjourn, tell me, if you know, how long it will take, and if you know, say so?

A. I do not know, it would be foolish in answering that without computing it, and it can be computed.

X Q. You had not done it before you testified?

A. I know it was not possible for it to come down like you
1267 spoke of, and I know from those physical laws I tried to explain to you, which any engineer ought to understand, it makes no difference, it isn't the time it took, it just don't make any difference.

X Q. I gathered you had some definite opinion.

A. It isn't a question of thinking, I know.

1268 By Mr. JACKSON:

Q. Colonel, you were asked something about boulders in New River. What do you include within the term "boulders"?

A. I include any large stone which a boat may run upon.

Q. That is any stone that is projecting in the channel?

A. Projecting or loose or whatnot in the channel.

Q. It wouldn't matter whether it was loose or attached to the bottom; it is a question of whether it is a protruding stone, projecting stone?

A. If it happened to be one over a rapid or something like that attached to the bottom and just an element of it, I wouldn't call that a boulder. It would be a part of the shoal.

Q. It would be a part of the rock formation in the shoal?

A. Exactly.

Q. Colonel, at 2539 of the record there is a sentence that reads, after you said "There are many boulders in New River. However, these boulders would not block the channel to boats in general"—then this sentence, "If most are concealed and if they are not known." Is that "if" right or is that an error? I merely thought that the "if" was an error.

A. There are several places in here that the sentences are not properly punctuated. In other words, they have a half of one sentence into another. What page is that?

Q. 2539, and it says "If most of them are concealed." I thought that must be an error and I wanted to find out whether the "if" was wrong.

A. May I read my correction of that paragraph?

Q. I would rather you would tell me whether that "if" is wrong now. Do you see the sentence I mean where it says "If most of them are concealed."

A. That should read, "If most of them are concealed and not known." Is that clear? Then a comma—"they would be dangerous." You can omit "or dangerous"—"to navigating New River" is the meaning of it.

1269 Q. I had no trouble except with the "if." I thought you probably stated definitely either that most of them are concealed or not one or the other.

A. My testimony required making long statements and I was interrupted time and time again by the lawyers and perhaps at times I didn't state just what I meant. There are a few places where it should be corrected and this is one of them.

Q. As I understand it, Colonel, you feel that if these boulders or rock obstructions are removed from the channels and the channels marked so as to enable boats to avoid any concealed boulders or rocks, and so forth, and local facilities are provided for by-passing the worst places, the river could be used for light draft navigation?

A. Yes, sir, I will tell you why. There are many boulders in the Tennessee River all the way from Big Bend Shoals——

Q. I don't want you to describe the Tennessee River because I am not asking you about it. I don't want to be captious but I don't want you to go into that because we will have a long discussion about it.

A. What I wanted to explain was my own personal experience.

Q. I don't want you to do that.

A. If you don't want me to put the word "Tennessee" in, very well. I can leave the word "Tennessee" out. Now, in my experience as an officer in the Corps of Engineers, when engaged

upon the operation and maintenance and construction of open river improvements for navigation, I have found many boulders in the channel of large navigated rivers for 400 miles in almost every pool. When I took charge of the office that section of the river had never been marked out.

Q. Took charge of what office?

A. You won't let me mention any names. I will leave it out.

Q. I don't want you to tell a story with an assumed name any more than I want you to tell one with actual names.

1270 A. Wait a moment. You have asked a question.

Q. You have answered the question, Colonel, and I don't want to get into a discussion.

A. I have not completely answered it and I think the Court should get this because it is very good.

(Defendant objects to the answer of witness on grounds that it is not responsive to the question and raises a collateral issue and defendant excepts to the ruling of the Court in allowing the answer).

By the WITNESS (continuing):

Continuing my explanation of the reason why I said the boats could use the river, when I took charge of the office I had this 400 miles of river marked out. I had boulders removed. After that was done I myself personally, in a boat, our boat, with a draft, one of them, of only about four inches and the other only about a foot when running at a speed of about 40 miles an hour, navigated this river up and down in the open river section. These two boats were bought just a short time before I left there and the District Engineer ran the entire length of the river. He was no pilot, had nothing to guide him except these markers.

By the COURT:

Q. What river are you talking about now?

A. I am talking about the Tennessee River. So that you see that if the river is properly marked——

By Mr. THOMPSON:

Q. Which river?

A. If any river is properly marked and the channel is properly marked out there should be no danger of a person who knows how to properly run his boat in following the markers provided the velocities are not too fast and things of that nature. In other words, the markers are the perfect guide for avoiding the concealed boulders.

1271 By Mr. JACKSON:

Q. Colonel, did you ever operate a large electric power system?

A. I had charge of the operation and maintenance of the Wilson Dam Power project at Muscle Shoals for about five years.

Q. Was that a large electric power system?

A. No, I have never had charge of a large electric power system but in my experience in the Corps of Engineers I was ordered to take charge of surveys for the improvement of rivers for navigation and for the prosecution of general plans in conformity with the most efficient development of the river for flood control, power and other beneficial uses. In that it was absolutely essential, in order to carry out that survey, that I make a most thorough study of the operations of power projects so far as they effected the development of the river for navigation and other purposes, in order to see that the power projects could be most efficiently developed. Those projects included about 150 projects on one stream and about 50 or 60 or 70 projects on another, on all the numerous, various tributaries and all kinds of streams.

Q. Coming back now to your actual operations, Colonel, your experience in the operation of Wilson Dam consisted in operating a single generating station and selling the power to utilities on a dump basis?

A. I can explain.

Q. Can you answer that directly, Colonel?

A. Will you please explain to the Court so he will not miss it, what dump basis means?

Q. Will you explain what dump basis means to you?

A. I have asked you because I desire the question.——

By Mr. JACKSON:

Q. The colonel asked me to testify. I don't know how much weight it will carry. By "dump basis" I mean you simply have a power plant running and if and when you have power avail-
1272 able and if and when somebody wants it, you sell it to them wholesale, no responsibility for maintaining and carrying any load or anything else.

A. No; it was not run on a dump basis. It was run under contract for delivery of the power to a power company.

By Mr. JACKSON:

Q. The contract required delivery merely on a dump basis, didn't it?

A. No; it required us to deliver the power available when called for. We were on the other end of the line. Instead of us going ahead and going around and marketing it when they needed it, they asked us to furnish them the power and we did so.

Q. Did you always have maximum capacity of power available?

A. No; I think a clear understanding of that question requires a little explanation. While I was in charge of Wilson Dam power

project Congress did not know what to do with Muscle Shoals. They would not permit the Chief of Engineers to make a contract for the sale of power from the project which could not be revocable, I believe it was, in one month notice, or something like that. As a result, any company that we would want to go ahead and sell or lease the power to could not afford to pay us any more for the power than the necessary cost of coal and actual operating of its steam plants for the simple reason to get around the necessity of a power company having enough actual installations in its system ready and at all times available to carry its maximum peak demands. Therefore as the contract was revocable upon short notice, they could not rely upon this power for furnishing their maximum prime power demands. Therefore we could not operate the power project and develop the entire load there. We simply had to sell and get the best we could out of it until Congress made some provision for the operation of the project.

Q. I am not complaining about it, Colonel. Whatever the reason, the fact is that the Muscle Shoals power plant was
1273 operated when you were District Engineer on the basis of selling the power as dump power, when and if available, to such persons as wanted it or when and if the contract purchaser wanted it; is that right?

A. Well, perhaps you and I interpret somewhat differently the word "dump." I would say it was sold under contract subject to their call when they needed it. That would be a clearer explanation. I think the Court could understand it clearer.

Q. As far as I know the question of dump power hasn't anything to do with the question of whether it is a contract, but we will let that be. It is, of course, a fact that from the standpoint of operating a particular generating plant, the operation may range anywhere between run of river operations and extreme peaking such as you described in your direct testimony; is that right?

A. That is correct.

Q. And as a practical matter, isn't it a fact that peaking may and probably will vary with the time of year and the flow conditions in the stream?

A. Yes, and there are other factors and a very important one is the amount of pondage which can be made available.

Q. Do you know how the Appalachian peak was apportioned among its generating stations in 1935?

A. No.

Q. You do know that the Appalachian peak was carried in 1935 without the Radford plant, don't you?

A. Your question implied that I should know that in order to determine this problem.

Q. I am making no implications. I would like to get facts, Colonel.

A. Will you read the question.

Q. (The question was read.)

A. Yes, sir, that is clearly understood. The Radford project was not built.

Q. And you don't know how the Appalachian peak will
1274 be apportioned among generating plants in 1936 and '37, do you?

A. That is not necessary for me in the solution of the problem which I was ordered to determine.

Q. You understand I am not arguing with you, if you will just give me the facts.

A. I must know the general form and shape, and so forth, and that is all I need to know. I do know that you can plot and assign those hydro-electric power units to carry that peak load in any shape, form or fashion which the needs of the system demand.

Q. There may be a wide variation in distributing those peaks?

A. There may be a wide variation in distributing those loads, yes, sir. That is correct.

Q. Colonel, am I correct in understanding you to say that the regulated low water flow at Radford will be 1,230 second feet and that the maximum or hydraulic capacity of the installed machinery at Radford will be around 9,000 second feet?

A. I took those figures from your own data. If you wish to modify them slightly, it is perfectly O. K.

Q. I am just trying to get something that we agree on so we can go to something else.

A. That is fine.

Q. Will you tell me what is the hydraulic capacity of the installation in the Government London navigation dam?

A. Those are data of record. I haven't the terms before me right now.

Q. Isn't that hydraulic capacity 9,000 second feet?

A. As I stated, I haven't data before me at present and I do not know exactly what they are now.

Q. Isn't your study of the problem sufficiently extensive and thorough that you can say that is approximately right?

A. I would have to look up that. No, I could not tell
1275 without knowing exactly what they are.

Q. Isn't it a fact that the low water flow at the London plant is approximately 1000 second feet, the natural low water flow?

A. The natural low water flow at the London Dam is about 1,000 to 1,100.

Q. Don't you know it to be a fact that the hydraulic capacity of the power installation in the Marmet Government Dam is about 9,000 second feet?

A. About 9,000 second feet. I am very glad to know that. The exact amount of it was not necessary for my solution and I did not take the trouble to look it up.

Q. Can you tell me whether it isn't also true that the low water flow at Marmet, natural low water flow, is around 1,000 or 1,100 second feet?

A. It is approximately that, yes, the extreme low.

Q. And isn't it a fact that the hydraulic capacity of the power installation to be placed in Bluestone in accordance with the Government plans is approximately 10,000 second feet?

A. I do not know exactly what that is, as it has no relation to this project except that insofar as the Bluestone project may affect the hydraulics of the flow—that is, may affect your modifications of the stream flow as they come down stream. I think I have seen it but I haven't it figured right now. It had no bearing on the present problem.

Q. I don't want to argue with you about that, Colonel. I have no objection but if you will only answer what I ask you it will save a lot of time.

A. I am doing my best so we can get through. I am not trying to simply combat you in the least. I simply desire to do my best to give the information you want, to you and the Court, but I don't want things you ask me misinterpreted. That is all.

Q. At page 94 of Government Exhibit 145, House Docu-
1276 ment 91, the so-called flood control report on the Kanawha watershed, one of the pages in reference to Bluestone, it states, "The project includes 120,000 horsepower hydroelectric plant."

A. Where is that.

Q. The sentence just above the table in the middle of the page.

A. The total parts of the project?

Q. "Including 120,000 horsepower hydro-electric plant." As an engineer, don't you know with a head of 120 feet such as is contemplated at Bluestone and an efficiency of 88 percent, with the reservoir full, this power would require a hydraulic capacity of about 10,000 second feet?

A. You are asking me some questions now which require making mental computations and I haven't yet seen the sentence you are talking about. "The total cost of this combined project, including a 120,000 horsepower hydro-electric plant is estimated," and so forth. Your question w... "wouldn't I know as an engineer——"

Q. At Bluestone with this project with a 120 feet head and 120,000 horsepower at 88 percent efficiency it would require 10,000 second feet flow—for any reasonable efficiency?

A. Just a moment. Maybe I can help you. I can look up the data and give you an exact answer but if you wish to assume 9,000——

Q. 10,000.

A. I mean 10,000, I will accept that for the time being.

Q. If you find any error in that, let me know.

A. That is perfectly satisfactory—fine.

Q. Isn't it a fact that the planned or expected minimum regulated flow at Bluestone is to be 2,000 second feet?

A. That is correct, as I understand.

Q. Colonel, is it not a fact that the operation of a reservoir for power purposes is based upon a so-called rule curve which is computed for the worst year of record, that is to say, to provide throughout the low water season as much of the installed capacity as possible throughout the longest low water period of record.

1277 A. I would say your rule curve should be based upon platting the entire period of record, the entire period of record, not the worst years, but the entire period of record, so you can do two things. One is you can so regulate your reservoir it will not be reduced below the minimum, and in the second place, so that you can operate that reservoir at the same time; that is, not go below the minimum, and at the same time get the total maximum output you can out of it, because if you don't do that you will find you are continually and continually operating that reservoir to be sure of a low flow, when if you went on the constructive rule curve, you could turn out a great deal more output in many periods.

X Q. Simply stated, am I right in understanding the facts to be this, that in operating a reservoir the operators construct a rule curve which enables them to determine how they should use that reservoir throughout the low water period, so they will be able to have a uniform benefit of it throughout that period, and consume it as nearly as possible by the end of the low water period, but not exhaust it?

A. Yes, sir; but you qualified it by stating a rule curve based on low periods, is why I took so long to explain.

X Q. And in any practical operation that is the way a power reservoir should be operated?

A. That is the way a power reservoir should be operated; if there were not any group of projects, where it has to vary its flow to meet those of others now that is true, for the entire output of the system, instead of platting a single reservoir, and you platted a mass curve or table for each of the projects of the system, and plat one for the total and make your rule curve for the total.

X Q. As a matter of practical operation doesn't every utility have a rule curve for its reservoirs?

A. Yes, sir; except when you get that line showing what you can turn out, that will be modified by what your demand is.

X Q. You cannot modify the amount of water?

1278 A. This line does indicate an average of what you have to stick to.

X Q. In practical operation the rate of use during the low water period may be accelerated or retarded according to variations in water conditions departing from that rule curve that may occur during that period, but always in a fashion so as to preserve the capacity throughout the low water season; isn't that true?

A. Your question is involved, but I think you are correct, that is the idea of it.

X Q. Now in normal operating practice, the development of power at a reservoir would not be discontinued during low water season for the purpose of replenishing the reservoir, would it?

A. That may come about in a number of ways.

X Q. I am asking you for normal operating practice?

A. Of a normal reservoir system, no, sir, but of the unusual lay-out of the Appalachian Electric Power Company system I can readily see, without going ahead and trying to work it out, that there will be times when your reservoir, in order to secure the maximum economical return, will vary its flow greatly; does that answer your question?

X Q. I understand you to say in your opinion you have, or might depart from that normal procedure, if you were operating the Radford reservoir?

A. I will state it this way. In order to secure the maximum economic return from the Radford reservoir, you would have to fluctuate it up and down in order to maintain a uniform supply demand for your system.

X Q. We don't have to subordinate everything in our business and other relations to securing the maximum economical return to ourselves, do we?

A. I will state that a little clearer, if you wish. It is a practical common sense, usual method. You can leave out economics for the time, letting the operator of the reservoir meet your demand and that is what he does. He has to vary it with this reser-

1279 voir of yours. You have absolute liberty of fluctuating it up and down, to meet the demand.

X Q. You are talking about a fluctuating output rather than fluctuating reservoir, are you not?

A. I think you will find that statement answers your question, because you may fluctuate it up and down at all flows you want to. You may be required to fluctuate it up and down.

XQ. The only compulsion you can suppose is what you conceive to be the necessity of obtaining the maximum economic advantage of any transaction; is that right?

A. It is a little more than that, I think. If I were operating it, or if you were operating it, and you were there, it would just be common sense for you to do it, knowing the way it is operated. I wouldn't say it is. I make that statement emphatically. You must do it. If you think after all we don't have to operate this and get the most money, very well, it is just common sense to do it. May I state it that way.

XQ. As I understand you, you consider it common sense to operate something, or to do something, to get the maximum economic return out of it, whether or not that would be forced labor or in some other manner an infringement on the rights or privileges of others?

A. The question is a little long and involved.

XQ. Read the question. [Question read.]

A. Yes, of course, there is the human element in all business and all factors, yet I think we generally find it as a business proposition. We do go ahead and attempt to get the maximum economic returns from our investments. The President and Board of Directors of power companies would have a very hard time explaining to their stockholders if they did not do it, unless they showed justification.

XQ. They would only attempt to obtain maximum benefits within legitimate limits?

A. Yes.

1280 XQ. Would you recognize legitimate limits?

A. Yes, sir; but I think the management would have to explain why they didn't go ahead and secure the maximum results, if the variations were large.

XQ. You have been talking now about variations from normal practice. You are speaking now of variations in load out-put and not about any shutting off of the production of power to replenish the reservoir during low water?

A. Variation in load out-put means virtually the same thing as variation in stream flow, I mean in volume, but not the discharge.

XQ. I mean, we were talking about the operation of the reservoir in accordance with the rule curve and my point is that all you have said about possible departure from normal has had to do with departures which you assume might be desirable for the purposes of handling the load?

A. Yes.

XQ. And which might affect the rate of draw-down?

A. Yes, sir.

XQ. But you were not supposing departures from the normal f such character as would involve the cessation of power devel- pment during low water, and the use of a low water period to eplenish the reservoir solely for that purpose?

A. I see your idea. I can explain it this way. I can see in the peration of your system, including the Radford project, that hese fluctuations will go up and down at all times, or at all tages.

XQ. What fluctuations?

A. Of the actual flow you turn out, or actual power you pro- luce for that specific project. Now due to the fact that cutting ff your reservoir does not cut off any of the other prime projects f the system, I can see where that will get closer and closer to ero. Now, furthermore, looking at your peak load curve of your ystem, and the power projects you have, and seeing the pondage you have available at the other projects, and the enormous
281 capacity you have available at this project, I can see at times you are going to utilize the great storage of this roject, to meet big variations in demand. Now that, in itself, s going to cause you to go ahead and use more power sometimes han you would ordinarily expect. There may be times when our rule curve isn't exact, due to exceptional demands your op- rator has utilized all his power down to the bottom. You see ny idea. Now if that happened at a time when you did not have o use these installations, not the maximum, you could readily nake up for that, compensate for that, by utilizing such installa- ion necessary. On the top of peak loads you could readily catch p the mistake of your operator. You see there are wide fluctua- ions, controlled by two factors; first, keeping your reservoir so s to have available, I might say, or demand, to meet so much; nd in the second place, to variate that demand to meet your ower demand; and in the third place, vary the actual amount f water used out of that reservoir to meet the actual peak de- nands. So a number of factors come in to help cause these luctuations. Any good engineer should be able to see it.

XQ. I don't think we understand each other, Colonel. De- artures from the rule curve merely involve changes in rate of rawn-down and not changes solely for the purpose of replenish- ng water storage in low water season; isn't that right?

A. I can't get the involved question.

XQ. Question read.

A. I don't get it. I can tell you why they occur, and have ried to, but departures from the rule curve involve changes in ne draw-down?

XQ. Yes.

A. You do depart from what you prepare to be able to maintain.

XQ. For power production purposes?

A. From what you are prepared to be able to maintain.

XQ. And those departures in the rate of drawn-down are for the purpose of meeting power demands?

A. They are.

XQ. And they are not solely for the purpose of replen-
1282 ishing the water in storage during low water season?

A. As I stated a moment ago, that is one of the things which may cause you to cut down or reduce or restrict your flow as much as practicable, in order to make up for either an exceptionally large demand on which you have used your storage in the reservoir to provide the pondage.

XQ. Do you intend to testify that in any normal or practical operation any utility operating a reservoir would depart from the rule curve merely for the purpose of shutting off the production of power during low water season, and undertake to fill its reservoir during low water season?

A. I mean to say an operator, operating an electric system, should follow a common sense practice. On one hand he has to sit there and try to make available a certain amount, and on the other hand he has to have the power demand.

XQ. Please read the question. [Question read.]

A. Frankly, your question is not a clear statement of fact, which I could answer with yes or no.

XQ. Let me try to make it clear.

A. I will appreciate it if you will.

XQ. Is it your opinion, or are you undertaking to testify that any normal practical operation of a reservoir for power development would involve a method of operation which would result in shutting off power production entirely during the low water season, solely for the purpose of filling your reservoir during low water season; that is, would you regard it as proper practice to operate a reservoir so as to call for its being filled during low water season?

A. Well, I may answer that by stating not in the normal layout system—now, in a system where we have an unusual lay-out—— [interrupted].

XQ. I understand you think everything is unusual here.

A. I am trying to present facts. You would have to squeeze
down at times, if you had to turn out certain demand and
1283 your installation was part of the prime, you would have to turn out that much, but if you put it up to the peak to squeeze that part, you still have the prime power and can reduce it without injury.

X Q. Are impounding reservoirs generally filled in low or high water seasons?

A. In high water seasons, for the simple reason with the proper lay-out of the system, with your reservoir up, you can cut down your flow with abundant power below, but in this lay-out of the Appalachian Electric Power Company, if you cut down the reservoir you do not cut down the flow of any of the other prime plants of the system.

X Q. In your opinion it would not be abnormal to fill the reservoir in low water season?

A. If you follow the fundamental principles of operation you have to follow that fundamental principle. That is, your reservoir project, any power system, has got to reduce or cut down its flow, when there is abundant power at its other projects, that, of course, is subject to the actual amount of installation at that project.

X Q. Is there abundant power in your low water season—[interrupted].

A. At times local showers—the Mississippi and Ohio and Kanawha are all dependent upon these varied local showers, one comes here and one there.

X Q. What has the Ohio and Mississippi got to do with the Radford power load?

A. It gets its water supply there, that is it exactly, and you get a mighty good flow for that section.

X Q. But, Colonel, will you just answer my question? Is there abundant power during low water season at other hydroelectric plants of the Appalachian Power Company?

A. I said due to these local showers——[interrupted].

X Q. Is there or is there not abundant power at other hydro-projects of the Appalachian Electric Power Company system during low water season?

A. That will occur at times, yes.

1284 X Q. It is your testimony there will be frequent times of substantial duration when there will be abundant power at the hydro stations of the Appalachian, down on the head of the Kanawha and over on the James, during low water season?

A. There will be enough to cause appreciable modification of the flow of water coming out from the Radford project.

X Q. And that would cause a modification or appreciable modification, in your opinion, in the rate of draw-down at Radford?

A. Yes, sir.

X Q. You testified this Radford project could be operated so as to carry a 70,000 kw. peak, something like that, is that right?

A. It has 75,000 kw. I believe. If you have that installation there, you have the enormous capacity of this reservoir, and there is no reason why you can't utilize it to help meet the prime demand of your system at any time of the day or year, and week or month, with that enormous supply, as long as you keep the water in your reservoir, and that is an important part, and provided you keep catching it, even in low flow, to keep the water in there, so you do that.

X Q. Colonel, I have no objection, except it will take a long time, if you make a long dissertation in each answer—— [Interrupted.]

A. I am trying to make it emphatic, to give you all the opportunity in the world to catch me up, I am right here, you can catch me up as much as you please.

X Q. I fear the limitation of time will interfere.

A. I will try to make my answers as brief as possible.

X Q. Would it be possible to operate the Radford project on a limited peak, at low water season, so as to produce say 35,000 or 40,000 kw. capacity, for peaking purposes?

A. Yes, that is true, but—— [Interrupted.]

X Q. You need not go into it any further, unless you feel some sort of economic compulsion.

A. This is the point, this is a highly technical thing, and I would not like it misinterpreted.

1285 X Q. I don't think we will misinterpret it. Would it not be a very practical advantage to use the Radford project for peaking, even to the extent of providing 35,000 or 40,000 kw. of peak capacity, in the low water season?

A. I mentioned in the variation of your load that at times you may even go ahead and reduce the peaking load you will carry, in order to conserve water in your reservoir. There would be times you would want to do it.

X Q. I will ask that the question be read. [Question read.]

A. Oh, I see, you mean as a matter of economics. Why I have not gone into the economics to that great an extent, and it is not necessary in my problem. What I have stated is, you do carry peak loads, you must carry peak loads. I am not so much interested in the exact amount; the factor is there, and you do affect the stream flow with it.

X Q. You have stated at low water season the run-of-river operation would only produce 8,000 to 10,000 kw. power?

A. Approximately.

X Q. Would it or not be an advantage to peak that operation to the limited extent which would raise the peak power production to 35,000 or 40,000 kw. in prime peaking capacity, as compared with your 8,000 to 10,000 run-of-river production?

A. Now if you desired, and your demands required you, at that plant, to have only a peak of 35,000 or 40,000 kw. why make it 75,000? That is, if that is all that was necessary to go in your prime base. You see we have to go back and see if we have enough prime plants to go in that base.

By Mr. JACKSON. I move to strike the answer, and ask to have the question read, and the witness answer it.

NOTE. Question read.

A. The correct answer is as I have given it, and I will tell you why.

NOTE. Question and answer read.

By Mr. JACKSON. I asked if peaking to the extent of 35,000 or 40,000 was a practical advantage compared to run-of river operation? Any engineer can answer that yes or no.

By the COURT. I don't think you got an answer to your question.

1286 XQ. Will you say whether it is or is not a practical advantage, to operate that project by peaking it to the extent of producing 35,000 or 40,000 kw. of prime peaking capacity, as compared to a run-of-river operation producing 8,000 or 10,000?

A. It would be of greater benefit; is that what you mean?

XQ. Yes.

A. That is O. K.

XQ. In your testimony what did you assume to be the duration of the Appalachian peak in hours.

A. That is not material to the solution of my problem.

XQ. I didn't ask if it was material.

A. I didn't assume any fixed duration.

XQ. How long did you assume the Radford plant would carry the peak load of 75,000 kw. assumed by you?

A. It will vary greatly.

XQ. What did you assume in low water season?

A. Well, I will answer, if you will give me time. The figures I gave for the ponding, for the amount of the volume, indicate quite clearly to any engineer that it was operating about half time and put it half time you have, or you might vary more than that, but about that figure. Does that answer you? That was simply an average. You can go greater or less, as much as you please.

XQ. Your stated the regulated flow during low water season would be 1230 second feet. Will you tell me how long during the day the Radford project could operate at the peak load producing 75,000 kw. such as you assume?

1287 A. I desired to obtain simply average figures to put in these estimates; therefore, I put in your poundage for half a day each week and on Saturday and Sunday—— [interrupted].

X Q. But, Colonel——[interrupted].

A. I am answering it about as positively and briefly as I can. That will allow you to fill up and concentrate on half of say these two loads. Now, looking at any utility peak it isn't a straight block, it is a curve, very often the big mass is somewhat of a triangle. Now, if you have 2⅔ of the average daily regulated flow, there available, multiplied by two, that is a triangle, then you have something like this load going up here, something like that shape [indicating with hands]. It is a general mass I am hitting at.

X Q. It may be clear to an engineer, but doesn't mean anything to me. I will ask the question be read, and that you tell me, in hours, how long you assume this peak would be carried? [NOTE.—Question read.]

By the COURT. I thought he answered that he assumed it would be operated about half the time.

By the WITNESS. It would be operated about half the time for the bottom of the base and may go up to the top.

X Q. I will ask the question again. I don't think it has been answered. How long did you assume that the Radford project would be operated so as to produce a peak capacity of 75,000 kw. each day during the low water season, when you say the regulated flow was 1230 second-feet?

A. I assumed it would be operated?

X Q. How many hours?

A. It will vary and fluctuate, just so you turn out a certain volume of power.

X Q. You were going to turn out 75,000 kw. peaking capacity. I want to know how long you were assuming you would turn it out each day in low water season?

A. You can vary it as long as you please, so long as you turn out the volume. As I have explained to you, an average would
1288 be about a half day, if you do not have an excessive demand, that would require you to utilize your storage. I have given you the stream flow and volume and figures. That may be squeezed in tighter and squeezed in lower.

X Q. Coming back to averages, is it or is it not a fact, with a regulated flow of 1230 second-feet for a day you could not operate the Radford plant at a peak to produce 75,000 kw. more than a little over three hours?

A. That is just exactly what you could do, you could run it all day long with a large storage in there if you wished.

X Q. I asked you how long, with a regulated flow of 1230 second-feet, for twenty-four hours, you could operate the Radford plant, so as to produce 75,000 kw?

A. My answer is you could run it all day long with the storage available—— [interrupted.]

X Q. I gave you 1230 second-feet?

A. You asked me how long I could run the Radford project. It is not dependent on the stream flow, because of the enormous capacity of the reservoir for pondage.

By the COURT. What is your question?

By Mr. JACKSON. My question is how long the Radford project could be operated to produce 75,000 KW during a day, utilizing, and utilizing only, the 1230 second-feet of regulated flow that is available or supposed to be available, day after day, during the low water season.

By the COURT. I am not certain I know exactly what you mean. If you released or regulated that flow when that dam is erected, you never would produce any 75,000 KW. You have to release about 9,000 cubic feet to reach the normal capacity.

By Mr. JACKSON. You are expected to have available every day in the low water season 1230 second-feet. That means at a uniform rate. You have a uniform amount of water of 1230 second-feet, twenty-four hours, and if you took the volume of water flowing, how long could you produce 75,000 KW with the Radford installation, and that is what I have been trying to get the witness to answer.

By Mr. THOMPSON. It seems to me there is a conflict in his own statement. May I say this, counsel has said, as I understood it, the witness has said there would be a regulated flow of 1230 second-feet. I don't understand he has conceded that at all, but has conceded that might happen, and he says if running peak loads it wouldn't happen.

By the COURT. Wouldn't the answer be what that proportion of the twenty-four hours represented to the 1230 second-feet?

By Mr. JACKSON. I think that is right, or a little over three hours.

By the WITNESS. May I explain?

X Q. Would you say that would be a little over three hours?

A. It is a misleading question. I have been sitting here maintaining for hours you don't have to turn out any of the 1230 second-feet. You might vary it as widly as you please; therefore, the only correct answer I can give you is, it varies widely. They can run it twenty-four hours if they please, with the enormous pondage in the Radford project. They can change it from day to day.

By Mr. JACKSON. I move to strike the answer.

By the COURT. If they did that, they could not maintain this storage to give them this regulated flow of 1230 second-feet.

A. My point is, there will be demands larger one day than the next, and they will not stick to the 1230, and the system will not require it.

X Q. If the regulated flow throughout the low water season is 1230 second-feet, is it not a fact you could not on the average, operate your project to produce 75,000 kw. hours more than three hours a day?

A. Let's work it out.

X Q. You can tell that in a minute.

A. It would be a short proportion of the day. If it is necessary, we will figure it out.

By Mr. JACKSON:

Q. Now you said a short time ago that you were willing to assume that the hydraulic capacity of the Bluestone installation would be about ten thousand second-feet. Is that right?

A. Subject to any further corrections that we might find later on.

Q. Then if that is true, is it not a fact that the installation which the Government proposes to place in the Bluestone, will have a capacity to operate on peak, which would result in flows varying from zero to a flow of 10,000 second-feet?

A. Your general idea is correct, Mr. Jackson, but, frankly, I have not looked up for some time the installation at Bluestone, because they had no bearing on the problem I was dealing with. I will be glad to look it up, but granting it is that, yes, sir; it would indicate that same idea.

Q. If there is 10,000 second-feet, it would be capable of doing that?

A. Yes, sir; something like that, that is correct.

Q. If that is not true, I wish you would let me know. Now, of course, it is a fact, is it not, that the Bluestone project is substantially closer to the head of navigation on the Kanawha than the Radford project?

A. Exactly, that is correct.

1290 Q. In your opinion, would peak operation at the Bluestone project have any effect on navigation on the Kanawha?

A. If proper provisions were not made to protect navigation it certainly would have a very deleterious effect, if those provisions were not made.

Q. It has a potentiality of operating on the extreme peaks you have been describing, has it not?

A. I have not gone into the Bluestone project. I am really not trying to argue with you, but I am trying to answer your questions frankly, and I said I have not looked up the installation, and I am sorry I have not.

Q. But if it is 10,000 second feet, it has that potentiality?

A. Yes, sir, if it is not properly regulated.

Q. Do you know whether the plan for the Bluestone project contemplates peak operation?

A. I have not gone into that question, because it does not enter into this problem. I will answer your question a little further. If the installation is as you say, 10,000 second feet, it would indicate that they would, and I do know if they are going to get the maximum economical return out of that installation, they have got to carry peak load. I am trying to give you the information that you want, exactly as you want it.

By Mr. JACKSON. Please read the answer of the witness.

(Answer read).

Q. You mean in that answer about 2,000 second feet, regulated flow?

A. Put that in if you want to; 2,000 second feet.

Q. Regulated flow.

A. Yes, 2,000 regulated flow.

Q. Now I desire to read to you from Page 116 of Government Exhibit 145, being a part of the report of Major Conklin with reference to the Bluestone project, as follows:

"65. If the plant was operated under a 100 percent utilization factor, approximately half of the power would be generated during the hours of heavy demand for power and half
1291 during the low demand period. For convenience, these periods will be termed day and night, respectively. The unit value of power generated in the two sections of a 24-hour period is about in the ratio of 3 to 1 in favor of the day power. It is therefore advantageous to power development to generate as much power as practicable during the day period. After careful consideration it was decided that the plant can be operated to use during the day twice as much of the daily flow as at night without injurious effect on navigation or power developments downstream. Studies of waves produced by intermittent operation of power plants in the upper reaches of New River indicate that operation with moderate changes in daily flow such as proposed at Bluestone will not require re-regulation for navigation and existing power plants downstream."

Do you agree with that statement?

A. I have gone into a much further study of this project than the District Engineer's Office has at Huntington, and I do not agree with that statement.

Q. You have gone into a much further study of the Bluestone project than the Engineer who made the report on the Bluestone project.

A. In this particular case, because I desired to go into the details of the effect——

Q. One minute, you say you have made a much more detailed study of the Bluestone project than the members of the corps of engineers, who were charged with the duty of making that investigation and report, and to make that report. Is that right?

A. Yes, sir, for the simple reason that the object of this report is to obtain a general plan but I had to go into more specific information than this report proposed to do.

Q. Now if any project as to the Bluestone plan, was approved, it is the project contained in this report, isn't it?

A. It is the project referred to and listed in this report, but the final plans of the project are not approved. This was simply a general plan of a suggested layout, and the final plans, I do not believe are yet completed.

1292 Q. Now, I will read to you further from the report of the Chief of Engineers, dated January 28, 1935, and appearing at page 2-3 of Government Exhibit 145, as follows:

By Mr. THOMPSON. Is that General Markham's report?

By Mr. JACKSON. Yes, that is right. I will read as follows: "On the New River and its tributaries, the plans provide for a series of dams with a storage reservoir capacity of nearly 1,400,000 acre feet, the utilization of upward of 2,000 feet of head, and the development of 454,000 primary horse power of nearly 1,500,000 primary peak horsepower at 30 percent load factor."

1293 Q. I will ask you whether that does not indicate or mean operation on a peak load basis?

A. If you will look up——

Q. Please answer my question.

A. I cannot say that it don't, because it don't necessarily in this report, it is on account of the report is prepared. If you will notice——

Q. Now, Colonel——

A. One minute—it does indicate it, but if you will let me explain it and tell you what it is exactly——

Q. Just tell me whether the statement does not mean that, this statement I have read to you, does not mean that there would be peak load operation to the extent of three and one-third times the regular flow?

A. Not that statement there, because you are speaking of this 30 percent load factor, and the basis of that is the manner in which the District Engineer prepared his economics of the development. He has listed in here prime power, then he has listed what he calls secondary, and he has the installation; all of this comes in there, and the way it is written up in this report, has 30 percent load factor. You see the idea?

Q. Well, let me ask you this question: Does the statement that the project will produce nearly 1,500,000 primary peak horse power—does that refer to peaking, or not?

A. Not unless you look at the average annual power and the flow.

Q. Can you produce 1,500,000 primary peak horsepower without peaking?

1294 A. Certainly, if you had a continuous flow. Over Niagara it would not be peaking in the least, it would be continuous.

Q. It would not be peak power?

A. No, sir.

By Mr. JACKSON:

Q. I direct the attention of the witness again to the sentence which I have already read as follows: "On the New River and its tributaries the plans provide for a series of dams with a storage reservoir capacity of nearly 1,400,000 acre-feet, the utilization of upward of 2,000 feet of head, and the development of 450,000 primary horse power or nearly 1,500,000 primary peak horse power at 30 percent load factor." And I asked the witness whether or not the production of 1,500,000 primary peak horse power at 30 percent load factor would not require peaking in the ratio of 3½ times the regulated flow?

By the COURT:

That means the utilization of the complete hydraulic

1295 power on a stream, does it not, or a project on that stream?

A. Yes, sir.

Q. Which would mean their operation at maximum capacity, wouldn't it?

A. Yes, sir.

Q. Wouldn't that be peak?

A. Not necessarily. I will explain why. The method that the officers used in working up this power, if I am not very much mistaken, was to call the primary horse power the low regulated power, you see what I mean, that is what they call primary horse power. All right. Now they call secondary power that part above this which, if generated, would turn into secondary power. That is the method used in District Engineer offices, in their study of the problem. It is not what I would use in my own study, I would use an entirely different method or system.

By Mr. JACKSON:

Q. You notice the figure is 454,000 primary horse power?

A. That was the low flow power.

Q. That is power from the regulated flow?

A. Yes, sir, the low flow power.

Q. Isn't the figure 1,500,000 primary peak horse power the result of converting primary horse power into peak power?

A. I do not believe it is. I think it is exactly what I told you, if you take the duration period, and I will say here, if it is important, I will be glad to look it up and see if it is that. I am practically positive that that is the way the District Engineer computed it here.

Q. Is not one million five hundred thousand substantially 3⅓ times 454,000 primary horse power?

A. Let us look it up, if you want to argue about it. Perhaps I will concede what you want me to say. What do you want?

Q. I just want you to answer my question.

A. I have answered it, but we will look it up in this book, and we will see if that is correct.

Q. Read the question. [Question read.]

A. Approximately that, yes.

1296 Q. And that is the same as dividing a hundred by 30 or 30 percent?

A. That is correct; and you get the same result the other way.

Q. Now while you are on that page I want to direct your attention to a statement of the Chief of Engineers in his report, page 3, paragraph 10, reading as follows:

"On the main stem of the river the regulated flow of the tributaries would afford at the Kanawha Falls plant and the three navigation dams, a total of 51,000 primary horse power or about 123,000 primary peak horse power, at 41 percent load factor."

Then there are a number of figures which we are not interested in in this case.

I will ask you whether that does not state a plan to operate the power plants of the three navigation dams on the Kanawha River, that is, the London, Marmet and Winfield, whereby the peak would be 2½ times the regulated flow?

A. I will have to give the same answer which I gave before, it depends upon the way this officer worked that up. If there is to be any further argument about it, let us look back there and see what it is, if you wish to take up the time.

Q. The Chief of Engineers made that statement.

A. But he took it from the District Engineer's Report. You can probably find the very same words in the District Engineer's report, and the Chief of Engineers took it from that. It is simply their system. It is not a system that I would use, but we can look it up if it is important in this problem, and definitely determine it. I am not trying to avoid anything. You want to find out if the plan makes provision for peak?

Q. Yes.

A. I know if you develop a power system up here you
1297 have got to have peak loads.

Q. Have you finished your answer?

A. Yes.

By Mr. JACKSON:

Q. Colonel, assuming that the Bluestone project be constructed and in operation, would not any effect on the navigable capacity of Kanawha River be dependent upon the method of operation dictated and carried out at Bluestone?

A. It would, yes, sir. In their report they state they will have a continuous flow of 2,000, but they do not state how they will carry it out.

Q. Was it continuous or regulated flow?

A. Continuous flow of 2,000 second-feet.

Q. Will you look up and let me know where that is—not now, but later on?

A. Yes, I will look it up if you want the information, but frankly when the project was submitted, the idea was continuous, and——

Q. I think you had better wait and bring that out after you have looked it up, because we are wasting a lot of time.

A. Just a moment, I think I have it here, no, that is the head. I wanted the flow of 2,000.

Q. If there is such a statement it is in Government Exhibit 145?

A. Yes.

Q. Now there is a difference between regulated flow of 2,000 and continuous flow of 2,000?

A. Exactly so, that is the point, there is a big difference, that is correct.

Q. And you insist that in this report, Government Exhibit 145, it is to be continuous flow, is that right, used continuously?

A. That is my understanding of the report now, and I am practically sure that is correct.

1298 Q. Just read the statement to which you refer.

A. In the middle of paragraph 13, on page 3, I read the following: "The District Engineer finds that this reservoir should be operated to reduce floods on the Kanawha and the Ohio Rivers, to increase the low-water discharge of the New River, to 2,000 cubic feet per second, which is about three times the natural minimum discharge, and to produce power, the revenue from which he estimated at over $900,000 annually."

That does not state continuous there, but I feel sure there is some statement in the report which does state that.

Q. Would that be consistent with a capacity of 120,000 horse power?

A. I again come to the very point we were talking about before. The engineer in preparing his estimate used the duration curve in which he called prime power, regulated low flow, and he called secondary power which would be actually produced by the water as it came along. You see what I mean? This is an entirely different thing from the peak load with which power projects normally operate to secure a higher prime flow during low water.

Q. It is your understanding that the Government project at Bluestone provides for installation for 10,000 cubic second feet hydraulic capacity to be used with the run of the river regulated low water flow of 2,000 second feet. Is that right?

A. It is my understanding when the final plans are drawn up, they will have prepared a plan and project, or the statement of it just as I said. He simply called prime power low flow of the water and just as I told you in regard to the secondary power. You understood what I said and really that is my understanding of it, I have read it over, and I know I changed from his method and went to the normal method in my study.

This was simply a rough study made by the District Engineer to determine the feasibility, but I went into it in more detail.

Q. In other words, you disagree with the project as described in Exhibit 145, and approved by the Chief of Engineers
1299 and you believe it will be carried out in some other way?

A. I do not disagree with him, but his method was simply a rough method of making an estimate. In other words, his method was simply the method used in a number of District Engineers' offices, in making preliminary estimates.

Q. You thought the difference of those installations between the production of one million five hundred thousand kw. and 454,000 primary horse power, was represented by variations in the run of the river production?

A. That is it, and not peak. That was simply a very rough estimate.

Q. That is, notwithstanding the fact that 1,500,000 is labelled "primary peak horse power"?

A. I don't understand his meaning of that in this particular study, because he has worked it out just as I told you, that is the way they have done it.

Q. You would not know what primary peak horse power meant, as applied to the run of the river plant, would you?

A. You would have to look at the context to see how he had worked it out, to really find that out.

Q. It would be an animal that you never ran across in ordinary engineering, primary peak horse power, with the run of the river?

A. It is a little unusual, yes, to be frank.

Q. Is it not true that it would not take three inches of Bluestone Reservoir to absorb all of the daily wave from Radford of the kind assumed by you?

A. You are speaking of three inches covering the entire reservoir at Radford?

Q. Yes, sir.

A. Two forces apply. In the upper end of the reservoir, you get the idea, it is applied to the upper end. As the flow of this water comes downstream, it causes the upper end of the reservoir to tilt. It then has two potential power factors that cause oscillation.

Q. One minute, I am not talking about oscillation but the simple question is whether or not three inches on the top of the Bluestone reservoir would not absorb the volume of the entire daily wave from the Radford project, produced by operation assumed by you, when, for instance, 2,000 second foot flow for 24 hours is being converted into peak wave?

A. It could not absorb it—what is it, did you say three inches?

Q. Yes.

A. Three inches of water all over the surface of the pool is not struck uniformly by this mass of water. Does that explain your idea?

Q. The volume would be no greater than that, would it?

A. I have not gone down to the figures of it because it was not necessary for me to go into the figures, you understand?

Q. From your study of the Bluestone project, about which you say you are better informed than the engineers who made the report, don't you know that three inches on the surface would have a volume greater than the volume of such a wave as you assumed for a day, utilizing the equivalent of a 2,000 second foot day?

A. I know this, I know the wave did not lift the whole 2,000 one inch all over the reservoir, it tilted the upper end, and that is where the force was applied, and that is where your oscillation occurs.

By Mr. JACKSON:

I move to strike out the answer of the witness and will ask that my question be read and that the witness answer it.

A. Would you mind withdrawing the words that I assumed that I knew more than the engineers who prepared the report did, because I never said that.

Q. Naturally you did not. Now read the question without those words.

(Question read to witness.)

1301 A. Now, having removed that statement, I do not see how I can answer it without explaining that the force is applied at one end.

Q. One minute. All I asked you for is a comparison of volumes and as an engineer you certainly can tell me whether these volumes would be equivalent or would not, or that you do not know?

A. My answer as an engineer is that this one inch of the whole reservoir is not concerned with it, because it is not there, and cannot be lifted or forced up or down or what not. It is the upper end that is forced up and down.

By Mr. JACKSON. I move to strike the answer out, ask that my question be read to the witness again, and will ask the witness to answer the question.

(Question read to the witness.)

Q. Can you answer the question.

A. I can say that I don't know exactly, but I think I have got a right to qualify my answers so that they will give you the information you ask for, as that is what I am trying to do. Frankly, I am not trying to argue, I just want to answer your questions as well as I can.

Q. If you cannot exactly say, that is enough.

By the COURT:

Q. Has any evidence been introduced to show the acreage of the pool behind the Bluestone Dam?

A. I believe we have it right here.

By Mr. JACKSON. It is in Exhibit 145.

By Mr. THOMPSON. At page 11 it says: "Area and volume of reservoir, the following table gives the reservoir area and capacity for the various elevations shown."

By WITNESS. Q. What is the normal pool elevation, do you know. Mr. Jackson, will you give me that, I have forgotten it from memory.

By Mr. JACKSON:

Isn't it 1490?

A. It runs up to nearly 1500, and the area is figured there.

By Mr. THOMPSON. Q. Will you give him the pool elevation so that he can answer your question?

By Mr. JACKSON:

I think the witness might state, if he can, the area surface at the elevation for power purposes and then the elevation at the very top.

1302 A. I have a table showing the area here, but I do not recall from memory the normal pool elevation of the

project. It shows on page 11 areas and volume of reservoir for various heights, but I do not recall from memory exactly what the pool elevation was.

Q. Colonel, to answer the question asked by the Court as to the elevation, 1,520 feet, the area is 9,040 acres, is it not?

A. That is correct.

1303 Q. Then at 1515, it is 8,636 acres?

A. Yes, sir.

Q. At 1500 it is 7,446 acres?

A. Yes, sir.

Q. At 1490 it is 6,698. Is that right?

A. Yes, sir.

By the COURT. That is all right, I have those figures here.

By Mr. THOMPSON. Your Honor asked some question about the flow on the Radford dam.

By the COURT. Yes, I think I have that. I thought your question referred to using the minimum hydraulic capacity of the plant and I was making some figures here of 9,000 cubic feet per second.

A. That was not the situation at that time. If there was such a flow as that it would be flowing through both plants and really on the run of the river basis.

1304 By Mr. JACKSON:

Q. Colonel Watkins, the London dam has an installation with hydraulic capacity of 9,000 second feet. Is it not a fact that that installation has a potential capacity of varying the flow from zero to 9,000 second-feet?

A. It has in the London dam, but that is subject to regulation.

Q. That installation was put in a Government navigation dam, under a government license?

A. Yes, and subject to regulation.

Q. But the installation provided does have a potential capacity of varying the flow from zero to 9,000 second-feet?

A. I don't know who put the installation in there. I believe the power company put in the installation on which it desired, but they were approved by the Government.

Q. They were licensed by the Government?

A. They were approved.

Q. Would any possible effect on the pool of the Kanawha by peak load operation be greater from a plant situated in one of the navigation dams than in one plant situated at Radford, 160 miles above those pools?

A. If it were allowed to operate at peak capacity, probably so. That is, to operate so that it does go ahead and do that.

Q. Now I produce a copy of a docume nt entitled Federal Power Commission, Washington, D. C., License on the navigable waters,

Project 1175, West Virginia, Kanawha Valley Power Company, and I read you the last sentence of Article 16, as follows:

"It is hereby understood and agreed that the United States specifically retains and safeguards the rights to use water in such amount, to be determined by the Secretary of War as may be necessary for the purposes of navigation. The operations of the licensee, so far as they affect the use and discharge of the water and the regulation of the elevations of all pools shall be controlled at all times by the Division Engineer, War Department,
1305 in charge of the improvements of the Kanawha River, pursuant to such reasonable rules and regulations as may be made from time to time by the Secretary of War in order to prevent any impairment of navigability."

Now the next sentence, which is the one I want to call to your attention is this: "Subject to the foregoing paramount conditions, the licensee shall so operate the power stations and utilize the pondage of the London Pool between elevations 614 and 611, that it will make the most efficient use of the water power potentially available."

And will ask you whether that last sentence would require some peaking?

A. It would require the maximum efficient development of power there which would require such peaking as may be done without interfering with navigation. Does that answer your question?

Q. Yes; and to utilize 3 foot pondage, for power at all, you would have to peak?

A. Yes; but that is a thing which the District Engineer and the representative of the power company should work out and between the two go ahead and so supervise and regulate it so that there is no interference. The point has two economic things, one is navigation, and one is power, and it should not be wasted, but we should utilize it as much as we can without interfering with navigation.

Q. Is it not a fact that the installation at Marmet and the proposed installation at London, one is and the other will have a probable hydraulic capacity in the vicinity of 9,000 second-feet, with potentiality or capacity to vary the flow from zero to 9,000 second-feet?

A. It will, subject to control, but not to interfere with navigation, it will have a potential capacity but subject to control.

Q. When I referred to London and Marmet, a little while ago, I meant to refer to Winfield. In the future the same thing will be true of Winfield, will it not?

1306 A. Yes, sir.

Q. In fact, the installation at Winfield will have a larger hydraulic capacity, will it not?

A. It should have, I should think—it is further downstream.

Q. And if it does, it will have a capacity to vary to a wider range of flow?

A. Yes. Of course, these figures that you mention are subject to correction.

Q. That does not matter for this purpose, there may be some variation.

A. Yes.

Q. Colonel Watkins, when the Winfield dam and the Gallipolis Dam, now both under construction, are completed, will the Kanawha River be a canalized river?

A. It will be a river there with pools, locks, and dams, with a 9-foot navigation.

Q. When you have a river that is completely improved for slack water navigation, so that you simply pass from one pool to another, is not that at least sometimes known as a canalized stream?

A. I think so, yes, sir.

Q. And the Kanawha River will be a canalized stream when these dams are completed, will it not?

A. Yes, sir.

Q. Is it not your opinion that waves produced by normal operation of the hydro-electric plant, or the hydro-electric plants, do not interfere with navigation on a fully canalized river?

A. If the projects there in this canalized section with a capacity of 9,000 cubic feet per second, operated in a manner to secure the most economical returns from this system, it would fluctuate the flow enormously; it would fluctuate the pools enormously. The wave going down would cause first, a rise, and a fall away below horizontal, and when the water is let out at the gates or through the turbines, it would soon be that the elevation of the pool would not be up to the crest of the dam.

1307 Q. As a practical matter, it is your opinion that normal operation of hydroelectric plants do not produce any interference with navigation or anything on a canalized stream?

A. I know positively that these dams would have the same effect I have described. When it fell back to the horizontal, it would not be up to the crest of the dam. The flow would be cut off. That would seriously interfere with navigation.

Q. I hold in my hand a report signed by you?

A. Yes, sir.

Q. Dated December 23rd, 1927?

A. Yes, sir.

Q. Addressed to the Chief of Engineers of the United States Army, and I read to you from page 26 of the report as it is

printed in House Document No. 185, Seventieth Congress, first session. I read this section.

Q. You will recall that I stated that I would read to you the statement from the report that I previously described?

A. Yes, sir.

Q. Signed by you, as follows: "In a canalized waterway, the fluctuations of stream flow caused by power plants will not interfere with navigation". And I ask you whether or not I have correctly read that sentence from that report.

A. Will you show me the sentence—show me the line?

A. I will point it out to you—This is the sentence here. I will ask that the question be read. (The question is read.) Have I correctly read it?

A. (No answer from witness.)

Q. Did I correctly read it, Colonel?

A. You have read it correctly, but I desire to explain it.

Q. Just a moment.

1308 A. No; I have a right to explain it.

By the COURT, So far the question is whether or not that sentence is in the report, that sentence just read.

A. Yes, sir.

By Mr. JACKSON:

Q. Colonel, in that sentence that I have read from your report to the Chief of Engineers, did you correctly and truthfully state your opinion to your Superior Officer?

A. I did, subject to the conditions under which the report was made. That is what I would like to explain. I can do so very fully.

Q. I am sure of that, but I suggest that you wait until your re-direct examination and your counsel can question you on it.

A. I would like to explain it now.

By the COURT:

Go ahead.

A. This report is in a report—a partial report on the Tennessee River and its tributaries. I was in complete control of designing the project—absolute control. I did design them so they would not interfere with navigation—all of the projects. I had a 10-foot sur-charge on the main stream project. During low-flow, I provided, as you will find in the report, to make the sur-charge elevation 5 feet. In that situation they would not interefere with navigation. The prosecution of these plans was in combination with the development of flood-control and power. The sur-charge elevation, the reserve flood storage elevation was to compensate for the flood storage of the channel displaced by the pool of the dam.

Q. The sur-charge on Bluestone is 30 feet, is it?

A. It is higher than necessary to compensate for the natural flood storage displaced. It is a flood storage project and
1309 for that reason, they made not only enough to compensate for additional surcharge storage. So, in view of the designs of the dams on the Tennessee River, my statement is correct. Coming to the Kanawha River, we find dams with designs absolutely different, that lose their head by one oscillation and spill water, which seriously interferes. These projects on the lower Kanawha are absolutely different from the Tennessee River, which I designed when I made the statement.

By Mr. JACKSON:

Q. The projects on the Tennessee River displace over six million feet of natural storage?

A. For the compensation of the entire system. The total
1310 in my report shows what is displaced, and the main thought was to provide for a 10-foot storage—some provide greater storage and some less, and the total is compensated.

Q. I direct your attention to a statement appearing on page 9 of the same report.

A. All right.

Q. And I will point it out to you. I direct your attention to this upper one here, on page 9, this sentence here—I will give you the question again—I direct your attention to sentence appearing at the top of page 9 in the same report, in paragraph 24, and read as follows: (Reading) "In canalized projects, when dams and pools are provided, a power project may vary the loads to meet normal demand, without interfering with navigation," and I ask you whether or not I have correctly read that statement from your report.

A. You have correctly read the statement.

Q. Now I ask you further, whether in making that statement to the Chief of Engineers, your Superior Officer, you honestly and fairly stated your opinion in that respect?

A. I did for the reasons I have explained in the other answer; absolutely the same reasons.

Q. I produce what appears to be a photostatic copy of a report on Application for License, Federal Power Project No. 1175, West Virginia, dated February 24th, 1932, and signed by George R. Spalding, Colonel, Corps of Engineers, and ask that it be marked Defendant's Exhibit 525, for identification.

(The foregoing document was marked as indicated.)

Q. (Continuing.) Colonel, I direct your attention to a sentence in paragraph 12, on page 8, of the defendant's exhibit 525, for identification, reading as follows: "The basic design of the dam

at the London site assures dependable 9-foot navigation at the upper end of the project (foot of Three Island Shoal, 90.57
1311 miles above mouth) with a variation of approximately three feet below normal pool elevation to absorb natural and artificial fluctuations in discharge"; and I ask you if that does not contemplate the use of this 3-foot pondage for power purposes.

Q. Will you answer the question?

A. It is there in that report. I have not studied it and I don't know the context of it.

Q. And you cannot answer the question?

A. No, sir; I cannot answer it that way. I have not studied the report. If I could see all these things and bring them to a close right here and now, I would be delighted.

Q. But you cannot interpret the sentence?

A. I cannot unless I look at the context; no one can; you cannot possibly do so. My answer here is apparent in the paragraph, if you will read it. This paragraph says: "The United States, through the Secretary of War, specifically retains the right to regulate the pool elevations in the interest of navigation. The basic design of the dam at the London site assures dependable 9-foot navigation at the upper end of the project (foot of Three Island Shoal, 90.57 miles above mouth) with a variation of approximately three feet below normal pool elevation to absorb natural and artificial fluctuations in discharge." I don't know what information they had on hand at the time the report was made, but the hydraulic effect that I mentioned to you is correct. I have simply stated the hydraulic effects which will occur.

Q. You cannot answer my question.

A. The right is reserved there for the Government to regulate. That is the point to the whole thing.

Q. I direct your attention to profile of the Bluestone on Exhibit 120. Is everything shown below the yellow area for power purposes?

A. The red area is supposed to be the reservoir storage area.

Q. It is the draw-down?

A. It is the draw-down. You asked if it was for power purposes. The object is for regulation of stream flow.

Q. It is used for power, is it?

A. Yes, sir, it is used for combined power—stream flow—it has two purposes, one to increase the navigable depth of water supply for operation on the Ohio—for the operation of the Ohio dams, and the other is for the development of power.

Q. The point is—all of the red area is the draw-down?

A. Yes, sir, it is there shown for regulation of the stream flow, if you also want to call that power.

Q. Is it used for power?

A. It is used both for power and navigation and flood-control, but I may add—I think, I beg your pardon, and flood control.

Q. The red is for flood control?

A. Yes, sir, that comes in and helps.

Q. That comes in and helps?

A. Yes, sir, it happens to be down in that particular ruled curve, and I don't know the proportion of the red available for maximum floods.

Q. It is not reserved for floods, is it?

A. No; but with good regulations, you can depend on it. It will always help.

Q. If any reservoir is drawn down for any reason, the part that has been emptied, will be helpful in flood control?

A. Yes, sir.

Q. Turn to page 111 of Exhibit 145—you have it there—House Document No. 91.

A. Page 145?

Q. Page 111 in Exhibit 145.

A. All right.

Q. And referring to that table——

A. Yes, sir.

Q. Tell me whether or not the tail water elevation of the Bluestone is 1370 feet?

A. The lowest elevation is 1490.

Q. Turn to the second column, countour elevation?

A. Oh, I see—1370 is the lowest contour.

Q. That is at the bottom?

A. Yes, sir, that is correct.

Q. That would be at the tail water elevation?

A. I suppose that is. As I recall since, that was the figure there.

Q. Will you turn to page 2 of the Chief of Engineer's report, in Exhibit 145, and state—I should say page 3, near the bottom of the page, and state whether or not under Title, Bluestone Reservoir, paragraph 13, it is not stated that at maximum draw-down, a head of 66 feet would be available during a year of extremely low flow?

A. What page—at maximum draw-down, yes, sir, a head of 66 feet would be available during a year of extremely low flow.

Q. And that would mean that that head of 66 feet—that the elevation of the pool would be 1436 feet, wouldn't it?

A. I would have to check it.

Q. You know it is 1370 plus 66?

A. I know they provide a 80-foot draw-down, as the draw-down for these flows.

Q. You told me that this elevation, at tail water elevation or base elevation is 1370?

A. Yes, sir.

Q. When you have a 66-foot head, all you have to do is add the 66 to 1370 to find what your pool elevation is?

A. No, sir; you apply the 66 feet—maximum draw-down.

Q. And head?

A. And head—the 66 feet would be the head during extremely low flow; at the maximum draw-down the 66 feet would be during extremely low flow.

Q. At maximum draw-down?

A. Yes, sir.

Q. I mean, that if the tail water elevation is 1370 and the head with maximum draw-down is 66 feet, the pool elevation at maximum draw-down would be 1370 plus 66, or 1436, wouldn't it?

A. It would be that, if that is exactly what the plans contemplated. I would have to study the report and see what you are driving at. You say add 66 to 1370?

Q. Yes, that gives 1436.

A. All right. Take it up there.

Q. Will you take your Exhibit 120 and draw a line through your profile Bluestone Reservoir elevation 1436?

A. All right.

Q. Here is a red pencil and a rule?

A. I have a pencil. It was 1436?

Q. Yes, sir.

A. This was a 10-foot elevation here.

Q. Yes, sir.

A. 36 would be up here. That is right.

Q. Mark it here so you can draw it straight.

A. That is close enough; that is about right (witness draws line as requested).

Q. The line on Exhibit 120, which I am indicating, with an arrow, I will mark it Colonel W.—is the one that you just drew, isn't it?

A. Well, don't put my name on it, because you told me to put it there. Suppose we mark it with Mr. Defense Counsel. I have done it under your direction.

Q. Is that line you just drew where the red arrow is?

A. Yes, sir, but let's not call it Colonel Watkins. I did that under your instruction and I haven't studied as to why it is there or what it is doing there. Let me mark it Mr. D. C., is the more appropriate thing.

By Mr. JACKSON. We will not mark it at all.

A. I drew it under your instruction.

By the COURT. Q. What did the witness say as to the meaning of the figures 66?

By Mr. JACKSON. I understood him to say that at times of maximum draw-down there would be only 66 feet of head at the power plant, which would mean that the water surface would be 66 feet above the tail elevation of 1370 feet.

By the COURT. Does that 66 feet represent dead storage?

By Mr. JACKSON. Yes, sir.

By Mr. JACKSON:

Q. Referring to your exhibit—to Exhibit 120?

A. Yes, sir.

Q. You stated, as I understood you, on your direct examination, that this showed projects authorized. Isn't it a fact that there is no project shown on either Exhibit 119 or 120 that has been authorized, unless it be the Bluestone project.

A. Yes, sir; all of these navigation dams below are authorized.

Q. I am talking about those you colored.

A. Yes, sir, I will explain. If I used the word "authorized," I should have said proposed or laid out in the general plan.

Q. I thought that is what you meant.

A. They were not approved except that work has begun in the Bluestone. We all know that.

Q. By that you meant that these are projects——

A. (Interrupting.) Yes, sir.

Q. (Continued) that had been proposed and described in this report?

A. They were part of the general plan. It is part of the 308 plan, yes, sir. If I said "authorized," I will correct it and say it is part of the project in the 308 report for the general plan.

1312 Q. Colonel Watkins, on your direct examination, you were asked to assume that there was a flow of 760 second feet at Radford?

A. Yes, sir.

Q. And a flow of 1,130 second feet at Kanawha Falls?

A. Yes, sir.

Q. And that the flow at Radford—was entirely cut off for ten days, or something?

A. Yes, sir.

Q. Was that as you computed it?

A. Yes, sir.

Q. There will be left only a flow of 370 feet of so at Kanawha Falls?

A. Yes, sir.

Q. And then you stated what would be the effects upon navigation of the pools of Kanawha River under the conditions in 1927 and I think later, perhaps—under present conditions—and

you stated that it would cause some recession on the ponds back in the London and Marmet pools?

A. Yes, sir.

Q. Tell me what becomes of the 370 second feet, so far as the London pool is concerned.

A. Between the time the question was originally asked and the time I was finally allowed to answer it, the lawyers had a long discussion, a great long one—so that in making the computation to determine the effect in the lower river, I should have brought in the regulation of the flow the way it would have been—what would it be. They gave 1116 for regulation the flow and it should be 1230. Have you got a piece of paper?

Q. What I want is, tell me where the 370 second feet went.

A. The part that was left?

Q. Yes.

A. It went on down the river.

Q. How could it go down—how was it lost out of London pool?

1313 A. It simply flowed down like any other flow. That was all the flow left there. In other words, the flow up at the London,—I mean the Radford project was 760, and down on the lower river it was 1130. If you cut off the flow of 760 above, there is only 370 second feet left in the lower river. That is also true if you cut off 12 second feet——

Q. (Interrupting.) We assume 370 feet left coming into the London pool?

A. Yes, sir.

Q. How did it get out of the London pool?

A. Just like any other water—it flowed on down the river.

Q. Do you assume that the gate was open?

A. You have a power plant and it probably went through into the turbines.

Q. You assumed that it went through the power plant, did you?

A. No doubt it would if it was not such a low flow it pitted the turbines—you will pit your turbines.

Q. Assuming the flow was reduced to 370 feet coming into the London Dam or London pool, and assuming there was no roller gates raised?

A. Yes, sir.

Q. And assuming that the power plant was shut down, would London pool lower below its normal level?

A. In the new dams?

Q. Yes.

A. As I looked at it, the leakage from the dam and gates comes to something like 30 or 40 cubic feet per second. The lockage, and for normal—maximum—for normal operation is about 312 to 370. You see the idea.

Q. Isn't it a fact that lockage at London does not exceed 7 second feet?

A. It depends entirely on the commerce—the lockages that go through—the lock.

1314 Q. Don't you know for any commerce using London Dam there, would not be 50 second feet of water used for lockage?

A. I know, as an engineer, what is required for lockage for various amounts of commerce, and for a normal, that is for a reasonably just estimate to determine the amount of water required for lockage, to take care of the lockage is about 50 a day. You could operate and use about twice that a day, but 50 is a reasonable basis, and that is what I took.

Q. Lockages per day?

A. Yes, sir.

Q. If you confined yourself to the actual situation, you would find about three lockages a day?

A. Yes, sir, but when we worked it into this plan and got the water supply for the lock, it used more.

Q. You were asked what would be the effect of the reduction in the flow in the London Dam to 370 feet on conditions today. Did you answer something else?

A. No, sir; I tried to answer you exactly.

Q. I am talking about your direct examination. You were asked what would be the effect today at London pool, or something to that effect, if they reduced the inflow to 370 second feet?

A. Yes, sir.

Q. That lockage today would not equal 35 second feet, would it?

A. That is absolutely im...aterial in this case, because the dam operated with a fixed crest. I did not consider that you were going to lower one iota the crest of the dam at the new pools. I said one to two inches, considering the reservoir regulations; it should have been two-tenths of an inch or one to two. There is a situation there—the water at the crest of the dam, it has enough to maintain it at the crest of the dam. If it is awfully low there, you are on the border line and can maintain it at the crest, but not at the upper end.

1315 Q. Isn't it a fact that you have enough water coming into the pool to take care of lockage and leakage and fully maintain the pool?

A. Lockage and leakage and evaporation; yes, sir.

By Mr. THOMPSON:

Q. What was that—evaporation?

A. Yes, sir.

By Mr. JACKSON:

Q. The evaporation is insignificant, isn't it?

A. It amounts to about 4 feet a year.

Q. Wouldn't you say under existing conditions, that the total amount of lockage, leakage, and evaporation at the London pool would not equal 50 second-feet?

A. I could not say that, for the reason that at Hinton down there, from Hinton down there, there is no increase in the flow, and it actually, according to data, appears to dip somewhere in places, due, in summer, to that factor. It drops down and is appreciable. I will say that it is appreciable there; I cannot say what was the amount. I am trying to give you the information you want.

Q. Colonel, I understand you are attached to the General Staff now?

A. Yes; I am on duty in the Military Intelligence Division of the General Staff.

Q. And your duties are to have charge of the Map Room?

A. I am in charge of the Map Room, yes; the Geographic Branch, we call it, of the division.

Q. And that has charge of the accumulation of maps of various countries and the preservation of them?

A. That is correct.

Q. Colonel, am I correct in understanding from your direct testimony that in your opinion there will be no dampening or lessening of the amplitude of the 8,000 or 9,000 second foot
1316 wave which you assume to be released from the Radford power station and measured at the Glen Lyn Gauging Station between Radford and Glen Lyn or, at least, any dampening will be negligible?

A. No, it will not be negligible. In using the estimate given in my report I considered a wave that left the project approximately like that of the general shape of the natural wave of the river. You, with the Radford project, will at times turn out high narrow ones and wide ones and all other shapes. The estimate of the dampening out which I gave for Glen Lyn and for the lower river was based upon my estimate of approximately, an average, if I may say that, an average for the particular flows which I applied them to.

Q. An average wave, you mean?

A. Yes; that is it. Frankly, there will be times I know, when the discharge that reaches Glen Lyn will be greater than that, due to the piling up of the back of the volume of water over the front. You see if you send out a wide block of water, suppose it jumps right up to 9,000 and goes over for eight or ten hours at that rate, the front part would not waste away but would run down and would form a tongue in advance. In doing that it has to fill up the natural channel of the stream. It could not proceed as fast as this back part of that block. The back part of

the block would therefore run up over the front. Now, in the figures I have used throughout, I have used very conservative figures, I have not tried to exaggerate and I simply took this average which I have given.

Q. Perhaps you can give me a little more definite idea of this average wave. What time in the morning did you assume that the typical wave would begin?

A. Let us take——

Q. Please answer that and then we will get along so much more rapidly.

A. All right. In the first place, it will depend just how far from the top down you go because you know the peak
1317 of the load rises in that way. It is on a slope.

Q. What time did you assume the wave will begin in the morning?

A. It will begin sometime in the morning between 4:00 or 5:00, or 6:00, whenever your peak load starts up. It may sometimes start even at 8:00 or 9:00.

Q. Well, shall we say 7:00 as an average?

A. Let us take 7:00 as an average. There is another thing that comes in there. You put in your machines as a block, the first ones that go in. You don't want to put these big machines right at the edge of that load.

Q. I haven't any objection to your telling all that you know, except it is going to delay us a lot. You said it might start somewhere between 4:00 and 6:00 in the morning?

A. I am trying to answer you as definitely as I can because you are never going to be just exactly the same height. Let us take 7 o'clock or 8 o'clock, anywhere along there.

Q. All right, take 7 o'clock. Before that wave started would the bed of the stream be dry or the flow be practically zero?

A. During periods of low flow it would.

Q. Taking 7 as a starting hour, what would be the outflow in second-feet an hour later for your typical wave?

A. Well, your units are four into 75,000 which is about 19,000; is that right?

Q. I think that would be right.

A. That would be put in and a little later on the slope the next one perhaps.

Q. I want to get a typical wave. We started at 7. What would be the output in kilowatts or the outflow in second-feet at 8, an hour later?

A. I haven't your load wave before me.

Q. But you have got a typical wave that you have been
1318 testifying about. Tell us what it would be an hour later in the day.

A. It will come in on the slope. I doubt if you would put in another machine in that time, an hour later. You are starting out with your plant with the 19,000 block machine.

Q. On a typical wave what did you put in at 7?

A. Let me describe it this way.

Q. No, please give it my way.

A. The volume is the thing that counts. The thing that counts is the bulk, the volume of the wave.

Q. Colonel, we are starting this typical wave of yours at 7. What is the output in kilowatts or the outflow in second feet from 7, starting at zero?

A. You desire to at least put in two-thirds of this 19,000.

Q. As one unit?

A. Something like that, to avoid pitting of your machines.

Q. Two-thirds of one unit?

A. Something like that.

Q. An hour later, at 8 o'clock on your typical power wave, how many kilowatts will you produce, or how many second feet of outflow, whichever way you want to state it?

A. Let us work it out this way——

Q. Please answer my question.

A. You have asked me for something and in order to answer I have got to compute it and I will compute it right here. All right, now——

Q. Suppose you compute it and give me your answer.

A. From 4 to 11 is seven hours. I said about 7, so to reach your peak there are four hours left. If you were putting them all in on that day, you will add about one of those an hour.

Q. At 8 o'clock on your typical wave you would have one machine in operation which would be 19,000 kilowatts?

1319 A. Yes.

Q. At the second hour, or 9 o'clock, on your typical wave how many kilowatts are you producing or how many second feet of outflow do your have?

A. I mentioned that you would just about put in one of those per hour if you were putting them all in on this particular day. Mind you, the thing that counts is the volume.

Q. We are going to find out what it is. You have this typical wave in your mind; no one else has, and so you have to tell me about it. At the end of the second hour, 9 o'clock, you have one more unit in?

A. One more and one more and one more.

Q. At 9?

A. At 9 and 10 and 11.

Q. Please let me progress so I will understand it. At 9 o'clock, at the end of the second hour, you have a second unit in, or how many kilowatts?

A. 7, 8, 9 and 10—your peak load doesn't come in until about 11 so that is a little too fast.

Q. You started out with two-thirds of a machine on at 7 and at 8 you had one machine on full. At 9 you had what?

A. At 7 I had one. At somewhat after 8 comes in two.

Q. At 9 how much?

A. Appreciably after 9 is three, and about 11 is four.

Q. Can you fix the third one any closer than appreciably after 9? Would it be 10?

A. No, I can't fix it better than that. If you want me to do it mentally, it is a question of splitting up. I believe your peak is about 11. It will vary.

Q. Before you testified did you ever figure out how many machines you would put in at the commencement of your peak?

A. Well——

Q. Did you?

1320 A. No; but let me explain. It wasn't necessary for the simple reason that I will tell you it is the volume that comes out of there that counts. That is the thing that counts.

Q. On your typical wave you now estimate that you would have four machines in operation by 11; is that right?

A. Yes.

Q. Is that the total capacity?

A. Four machines would all be in by that time.

Q. That is the total capacity at your plant?

A. Yes.

Q. How many machines did you have in operation at 12 on your typical wave?

A. Well, if 11 is the peak there are four machines there and you are not going to get any more because they are all there.

Q. Do you continue all of them at 12?

A. Now, before we go any further let us figure out the volume and see where it goes to. All right. I am trying to give you a typical——

Q. Please let me finish my question. At 1 o'clock or between 12 and 1 have you reduced the number of machines in operation?

A. Before I can answer you you will have to let me figure out the base and the volume and see just about where it goes. I can't answer until I do that, an engineer's means of computation.

Q. When you were giving your picture of this typical wave about which you testified, you did not either figure or estimate how many machines you would have in operation between 12 and 1, did you?

A. I looked at the volume, I tell you. That is what counts and also consider that you are going to put this in there with

your other machines. You have got that volume. You can apply your whole hydroelectric machines in filling out that volume.

Mr. JACKSON. I move to strike out the answer.

1321 By the COURT:

Q. Doesn't the volume of water being discharged depend on the number of machines in operation?

A. Yes, sir, and the length of time.

NOTE.—The question was read as follows: When you were giving your picture of this typical wave about which you testified, you did not either figure or estimate how many machines you would have in operation between 12 and 1, did you?

By Mr. JACKSON:

Q. You know whether you did or not, Colonel?

A. I figured it out mentally. I figured it this way: I figured the base we would have; I figured what the peak would come to and it is a geometrical triangle of somewhat near that. If I multiply one-half of the altitude times the base I get the volume or approximately there, absolutely near enough for our purposes.

Mr. JACKSON. I move to strike out the answer and ask to have the question read to the witness.

The COURT. Let it stay in.

NOTE.—The question was repeated as follows: When you were giving your picture of this typical wave about which you testified, you did not either figure or estimate how many machines you would have in operation between 12 and 1, did you?

By Mr. JACKSON:

Q. Will you answer that?

A. Your question implies that I have not solved this problem. I have solved it, and what I want to explain is to get down to where we belong as to volume and the general conformity and I can figure it for you here, sitting up in the chair without a piece of paper or anything of the kind, and I would like to do it.

Mr. JACKSON. I move to strike out the answer and ask to have the question read to the witness again.

The COURT. He has his own way of answering it, and he says he can't answer it any other way and if you are going to get any answer I think we had better let him answer it his own way and see what we get.

Mr. JACKSON. My difficulty is I get no answer.

1322 By the COURT:

Q. Go ahead and answer it the way you want to answer it and let us see how responsive it is.

Mr. JACKSON. I would like to have the question read.

A. I have it in mind.

Q. (The question was read as follows.) When you were giving your picture of this typical wave about which you testified, you did not either figure or estimate how many machines you would have in operation between 12 and 1, did you?

A. I figured by a mental process of seeing the wave before me. Right now I can work it out and I can give it to you if you will permit me to do so. Yes, I did it mentally, just the picture in my mind. I knew about what it amounted to. Now I can compute that figure and tell you what it was if I may.

By the COURT:

Q. Go ahead.

A. All right, sir. As I said, it was the volume. It is the volume that counts. All right; now, the hydraulic capacity of your plant is 9,000 cubic feet per second. All right. The volume of your average wave was 8,000 acre-feet. All right. Now, if the peak of the load is at 9,000 and the total volume is 8,000 acre-feet, 8,000 acre-feet being one-half of 9,000 day second-feet. The base of the wave if it was an absolute triangle would go up to 9,000 cubic feet per second and go down to the base at about the other end of the day. Then block it in so it fits in and you will have it fitting in up there, extending some two or three—say from 11 to 2, about like that, and the other end would boved in so there you go. Does that answer it? I have tried to give you a picture. I think that describes it.

1323 Q. Now, Colonel, will you tell me on this average typical wave of yours how many machines you had in operation at 2 o'clock?

A. As I said, apparently you still have all four of them in. Of course, I reserve the right to compute and check that if it is necessary because I am now sitting up here computing mentally. I have no paper; I have nothing.

Q. You have been all over that.

A. O. K.

Q. At 3 o'clock how many machines did you have in on this average typical wave?

A. Between 11 and 2 is three hours. At 2 o'clock you would still have apparently, as I see it, four machines in.

Q. At 3 I asked you about, Colonel.

A. Four in at 2 and the other in about 11—I have got to run the line down now from up about 2 down to the base.

Q. Do you regulate your machines according to how you have to run your line, or do you make your line from how you run your machines?

A. It is a matter of mathematics pure and simple, of getting the volume in. It is pure mathematics, running a triangle, and it is a little difficult to sit up here and do it. At 7 in the morning——

Q. 3 in the afternoon we are trying to get.

A. Beginning from this side at 7—at the end of the day, of course, is 7 the next morning. You don't want it that far. You want seven hours back from there. It is going to come down. 3 o'clock will be most all of them in—going to come on down.

Q. At 3 your best judgment is there should be three on or four?

A. Probably still be part of four on.

Q. Three and part of the fourth?

A. Apparently.

1324 Q. Now tell me how many machines will be on at 4 on your typical average wave?

A. May I have a piece of paper?

Q. I am perfectly willing to take just what you develop for your testimony if you can give me the figure.

A. No, you insist on every hour of the whole curve and in order that I can give a reasonable answer, I have told you the block, I have told you what it looks like; now if I must work out every hour, please let me work out every hour.

Q. Tell me what it is, how many machines you have operating on this typical wave?

A. Here is 6 o'clock in the morning.

Q. You started at 7 on this day.

A. I have to draw the various coordinates and lines here and plot a day's wave.

Q. At 4 o'clock, Colonel, how many machines?

A. As I have the wave drawn now, beginning about 7 it runs up in a line to about 11.

Q. We have had all of that. Let us go to 4 o'clock in the afternoon?

A. It comes on over to 2 o'clock and it begins to slope and shape itself down.

Q. How many machines at 4? We have got down to 4 o'clock.

A. Let me put in my four machines. The first one comes out, according to the rough curve I have got here, along about 6.

Q. At 4 o'clock how many machines, Colonel?

A. You still have all four of them in, according to this rough curve.

Q. A while ago you had one partly out at 3. Why was that?

A. That is correct. You probably would have one partly out. It would be a little bit more out at 4.

Q. And at 5 how many machines?

1325 A. Still a little bit more, getting close now to taking that one out if it isn't already out.

Q. And at 6?

A. At 6 that one is out according to this drawing.

Q. Three machines in at 6?
A. Three machines in, according to my drawing.
Q. At 7 P. M. how many machines?
A. At 7 P. M. I still have got three.
Q. And at 8?
A. At 8 o'clock I still have three. No; that would just about come out at 8.
Q. You mean at 8 o'clock?
A. You have got about half of them in.
Q. You would be down to two at 8, you think?
A. Just about at 8 o'clock you are about two.
Q. It drops to two at 8?
A. About that.
Q. And at 9 how many?
A. And at 9 you have got one and a portion in.
Q. Ten?
A. At 10 you are getting close to taking that one out.
Q. Do you mean getting down close to one?
A. Getting down toward one.
Q. And at 11?
A. You are at one, got part of one.
Q. 12 midnight?
A. At 12 the last one is out.
Q. It goes out at 12?
A. Yes; about that.
Q. Isn't it a fact, Colonel, that you arrived at all of those conclusions by constructing a theoretical curve to use a
1326 certain volume of water rather than by estimating the number of machines that actually would be in operation from hour to hour on a peak operation and drawing your curve in conformity with the facts?
A. No, that is not a fact. I had a mental picture. I know that you have got more machines. Furthermore, my mental picture has got a whole lot of other groups around here, where you are going to put them in and you can fit this block in just where you please.
Q. At any event, it is a hypothetical curve that you drew from which you have derived the number of machines you have in operation, not based upon any load curve, was it?
A. No; it was based upon—I didn't go into the absolute details of the whole thing. The very minute I think about it I get a picture of your load curve. It is an enormous curve. It will take all the capacity you can get there with your installations during low-flow periods. I know that. I know that those plants go in there. If you want a little more picture, all right; if not, I will shut up.

X Q. I think you have answered me unless you have anything further. Now isn't it a fact that what you did was to construct a curve that would utilize a certain previously selected volume of water in twenty-four hours?

A. No. What I did was to get a fair, reasonable, just basis for an average curve, that would not exaggerate or over-draw for the various flows, your low, regulated, and average annual, and picture to myself what would happen at high. Now with those flows as a reasonable basis to work from, I knew it was the volume that counted when going down the river.

X Q. In your testimony here this afternoon, I understood you to say you took for your wave 8000 acre-feet. Is that the volume of your wave?

A. I think you will find in my statement it was between
1327 8,000 and 9,000 acre-feet.

X Q. That is the volume of one days wave, of your average typical wave?

A. Yes, sir.

X Q. Well now, isn't it a fact that 8,000 acre feet would be equivalent to 4,000 second foot days?

A. That is correct.

X Q. And isn't it a fact the regulated flow during low water at Radford is estimated at 1,230 second feet?

A. That is correct. Not let's go to the average annual.

X Q. And isn't it a fact the average flow as testified to here by the Government's witnesses, the Radford average annual flow is somewhere between 3,200 and 3,300 second feet?

A. That is correct, but before you go any further, I want you to ask me some more questions.

X Q. I intend to.

A. That is the average daily but let's put Saturday and Sunday on it.

X Q. Let me ask you a question. You outlined for me awhile ago this average typical wave you have pictured in your mind in terms of installation, or machinery in operation, beginning at seven o'clock in the morning and ending at twelve o'clock midnight.

A. Yes, sir.

X Q. If it were possible, and if in fact that project, as it is proposed to be constructed, were operated throughout that period, in accordance with the description you gave the hour by hour description of machines in operation, what would be the volume of the resulting daily wave?

A. I can answer you in this way. If it were run a whole day, the base would be one day. Now the volume, and we know the load goes up to 9,000 cubic feet per second, all right, the volume in

a triangle with a base of one whole day, going up to 9,000 cubic feet per second is one-half of 9,000, 4,500. Now a day second foot is one-half of an acre, so you go back to the 9,000 acre feet.

1328 You see the idea. It goes back to a simple triangle, multiplying it out. I knew that without drawing a figure. It wasn't difficult for me in my mind; and the volume is what counts, I tell you.

X Q. Did you know that? You said you knew it before you put anything on paper. Did you know that before you ever made any study, if you did make any study, of the Appalachian load curve?

A. I didn't worry much about it, because I tell you it is the volume now that counts, and you can vary that all you please with these machines.

X Q. You had selected your volume before your investigated the load curve, if you did investigate it?

A. That is what counts in those waves, and the nearer the shape be to the characteristic curve of the river the better it will go down the river.

X Q. And you assumed a rather constant increase in triangle fashion in your typical wave?

A. I described it to you. They will step the machines in.

X Q. Now, I want to take up another phase of this typical wave of yours. In the matter of its dampening out, Colonel Watkins. As I understand your testimony on direct, and as I understand this Government Exhibit #145, the Bluestone report, the water surface of the power pool of the proposed Bluestone reservoir, when the pool is full, would be approximately 1,490 elevation?

A. The normal pool elevation on this chart is 1,490.

X Q. That is about the elevation of the natural and normal level of New River at the Glen Lyn gage, isn't it, or very near to it?

A. It isn't far from it. It is very near it.

X Q. Somewhere around 1,492 or 1,493 probably?

A. Something like that.

X Q. Referring to this average typical wave which you planned or assumed to release at Radford, how long, in your opinion, would it take for this wave to reach Glen Lyn?

A. The time required for the wave to go downstream is

1329 dependent upon two facts; one is the height of discharge of the wave; the second is the stage of the river, assuming this wave, this average wave, which I have estimated for average annual flow, to be released at Radford, before it got to Glen Lyn the stages of the river would probably be somewhat increased. Now roughly estimating, which I reserve the right to check, that

wave ought to go down from Radford, down the river, to the Falls, in two to three days, maybe two and a half to three and a half days, somewhere in there. Now down to Glen Lyn, that is, oh, a day to a day and a half, something like that, or not very far from it.

X Q. Might it be one day?

A. It may reach there in one day. I would have to work it out. I know it is somewhere in there. There have been different waves sent down the river. We can look them up, if you desire. There is a beautiful illustration from your Buck and Byllesby dams. We can look them up, they are official, and if you want something really worth something, let's get them out and see.

X Q. I am trying to find out what is in your mind when you testify. Now how long a period of time would it require to release this typical average power wave from the station?

A. We found on this little one we drew here you started at seven o'clock in the morning and closed at twelve o'clock midnight.

X Q. That would be about seventeen hours?

A. Something like that.

X Q. How long, in your opinion, would it take that seventeen hour wave to pass the Glen Lyn gaging station? Seventeen hours at Radford is the time of it.

A. When it left Radford it was seventeen hours long, and when it passed Glen Lyn it would probably be greater than that. I wouldn't be far from seventeen.

1330 X Q. Be substantially greater, wouldn't it?

A. Somewhat greater, but not much, because this is so near, the one I have is so near like the wave of the river, there would be very little wastage. I would say that is pretty near the characteristic wave.

X Q. Don't you think it would be at least twenty hours long?

A. I won't fight with you over the matter. You can call it seventeen or twenty, if you wish, somewhere in there.

X Q. Doesn't the increase in the time it requires this wave to pass Glen Lyn of itself show there has been some dampening effect?

A. No.

X Q. That is in your opinion, the duration or time length of the wave might be increased without any dampening effect, is that so?

A. Yes; if you put a wave out that was more of a block, assume it is a block up to 9000 if you wish, and let it extend down at each end, that type of wave would slough off on the front end and the back end would over-run the other, and it would be higher for a time than a maximum discharge when it left the plant.

X Q. We have plenty of trouble with this typical wave, without bringing in another hypothetical one. I want your opinion. Does the fact that the time element, or the duration of the wave in time, has increased at the point lower down the river indicate some dampening out or not?

A. Now, no; for the simple illustration I gave you, instead of dampening out it is higher and on the other hand it is longer than a block.

X Q. How much higher is this typical wave than yours that has become longer in time when it reaches Glen Lyn?

A. I was very nice to you in this case. I didn't assume it was any higher. I was very nice and conservative in my estimate, but some waves will be higher. I have simply taken a fair, honest figure, and not trying to exaggerate it one iota.

1331 By the COURT. You say it will be higher—higher than what?

By the WITNESS. Higher than a wave that is in the form of a block, your Honor, a maximum discharge of 9000 cubic feet per second leaving the plant. Suppose they started in and ran it from eight to three o'clock, a square block, that wave would be higher than 9000 cubic feet before it got to Glen Lyn, because this end sloughs off and goes forward, and as the wave goes down-stream, it can't go faster than it can fill up the natural storage channel of the river; it takes a little time filling that up. The back end of the wave, however, may flow down the river at the rate, depending on this height, which is faster than this end, so it would over-run that, and get higher than when it was discharged from the power project. I know that from my extensive studies of just what happens to a wave when it goes down stream. I have traced them thousands and thousands of miles for many projects and many formations.

X Q. As I understand you, as this wave goes down stream it gets higher in amplitude of volume and stage?

A. This typical wave I have given, I have been careful, and perfectly fair and honest. I started it out so it wouldn't get any higher and I have not tried to make it get higher.

X Q. But nevertheless if you had given just your honest judgment, you would have said it would get higher, according to your statement?

A. If it were a block, yes, sir.

X Q. Will you look at the exhibit placed on the easel, Government Exhibit #132?

A. Yes, sir.

X Q. You see the block waves in the chart?

A. Yes, sir.

X Q. And you see the successive figures as they go up the chart?

A. I am not familiar with the chart. I will have to take
1332 a look at it. Who can explain this chart to me? Can you explain it?

X Q. It was introduced by a Government witness. It is a picture of a typical wave. I want you to see if you agree or disagree that that chart shows a substantially accurate picture of what happens to a square wave?

A. Where does it start? May I have someone explain it to me?

X Q. Which is initiated with a 2000 second foot flow, peaking a 2000 second foot flow. Will you tell me, if that is a fair representation of such a wave?

A. That looks like 9000 there.

X Q. That is the top of the peak.

A. Who can tell me what this is, how does it go?

X Q. These are two waves, one following the other, and each of the two waves are shown on the diagrams, Exhibit #132.

A. Which was are they traveling?

X Q. Can't you tell?

A. Here is an arrow.

X Q. Can you tell by looking at the wave?

A. From the general shape this should be the front and this the back end.

X Q. Take the upper diagram which way is that traveling, from left to right, or right to left?

A. That wave has flattened down so I don't recognize it as a typical wave of New River.

X Q. Do you recognize which way it is traveling?

A. Well, with the head there, it must be traveling that way.

X Q. You mean from right to left?

A. From right to left, is what I would guess.

X Q. Coming back to the original question, do you agree that Exhibit #132 is a substantially fair representation of what happens to one of these square waves of 9000 second feet amplitude when it is discharged on to a dry stream bed?

A. Frankly, as a technical engineer, I do not think it would be the proper thing for me to look at the chart and say
1333 whether that is intended by it or not, or what conditions is was under. I do notice here are two 9000 and here are two 10,000——

X Q. You notice there are 1000 second foot base flow here, which adds to the two and four thousand here which makes it six?

A. Yes, sir.

X Q. I don't want to spend much time on this, but I wish you would tell me, if in your opinion, Exhibit #132 is a fair and accurate representation of what happens to one of these square boxlike waves with 9000 second feet amplitude projected on to a dry stream bed?

A. From my very long experience and computing many waves I anticipate a wave that starts out when it is a block like this, developed like this, it will more or less continue, if that is the characteristic flow of the stream, and will continue on until you hit part of the channel where there is a great deal of storage, and that spreads out more. That is a well known fact, it is the natural channel storage that widens your wave out, and where there is little it sticks up steep, and you have not got much on the New River, and is why you have a high wave.

X Q. Do you or not think the two upper diagrams are a fair representation of what happens?

A. I can't say. I say it is my idea your typical wave will go along and persist down the river.

X Q. Does that exhibit show the height of the wave becomes higher or lower as it goes down the river?

A. This indicates a 4000 c. f. s. at this point.

X Q. The amplitude of the wave is 2500, isn't it?

A. I would like to have it explained to me.

X Q. You can tell by looking at this chart, Exhibit #132, the height of the wave goes down as it goes down stream?

A. That is what this chart seems to do, but from my long experience I feel confident your wave will go down the stream and persist much more than that.

1334 X Q. And get higher?

A. It isn't exactly an opinion. I practically know it.

X Q. But you think it will get higher?

A. I should say the block, if it was big enough and long enough, it would get decidedly higher, for example, if you sent a wave out with only a maximum of 9,000 cubic feet per second, and it was one day long, it would get a great deal higher.

X Q. In your extensive study of this problem, did you examine the 1930 wave tests made by the defendant in cooperation with the U. S. District Engineer Office, and U. S. Geological Survey and the Federal Power Commission?

A. I did.

X Q. Did those waves get higher as they went down stream?

A. Yes, sir.

X Q. They did?

A. Exactly so, the broad square ones did.

X Q. They got higher between Radford and Glen Lyn?

A. Yes, sir; one box that came out was actually higher and if you had made that block longer, it could have been a lot longer, and still higher. You can look it up. It is there.

By Mr. JACKSON:

Q. Colonel Watkins, I hand you copies of Government Exhibits 133 to 141, which have been introduced in evidence as records of the experiments made in 1930, and will ask you to point out from anyone of those exhibits, with which you are familiar, any wave which became higher during its passage from Radford to Glen Lyn?

A. It would take a considerable time to locate it, but it is in here, this one does not look like it, that is too sharp.

Q. I think the two exhibits you want to look at are marked 138 and 148.

A. That is not it.

1335 Q. Just look at 138 and 148 and see if you find any?

A. I want one that has a long block on it. If I can find that wave, it is going to go up. This is at Glen Lyn, is it?

Q. I don't know, just look at it.

A. Let us go back up the river a little bit to a point where it goes higher.

By the COURT:

These waves emanated where?

A. Buck and Byllesby. When it starts out it starts forming a typical wave of the river, and as it proceeds down the river it gets higher.

Q. Now you have been talking about waves getting higher at Glen Lyn. Do you mean waves that originated at the proposed Radford Dam?

A. Yes.

Q. Then you want to get up the river, don't you?

A. Exactly so, that is what I said—Glen Lyn is down too far. If we go up the river and take one of those stations further up it would show it. I have observed it on the record.

By Mr. JACKSON:

At recess, if you can find what I have been asking you about, will you please call our attention to it. I will not take up the time of the Court to look for it any further.

A. Must I spend my recess looking that up?

Q. If you can find it, I think you had better spend your recess doing that.

A. All right.

Q. It is a fact that when the length of the wave over-all is increased, it shows that the slope on the front and on the back has become somewhat flatter?

A. If it has lengthened that would be true, yes.

Q. When you were testifying on the witness stand before, you ated that the slope at the front and back of your characteristic waves in New River are approximately the same and esti-
336 mated that the slopes are about 10 degrees to 15 degrees from the vertical. Do you remember that?

A. Yes, sir; I remember that. May I state that is a hydro-raph from which I gave you those figures and from a simple ental picture of the actual slope of the hydrograph and it does epend entirely on the scale, that is, the relative scale to the day, nd on the top it may be one and may be ten.

Q. You have been giving all of your testimony about these aves from a mental picture, have you not?

A. Well, that is what an engineer thinks about it, and he thinks bout a hydrograph that has measurements of the wave at a fixed oint and not of a wave that goes up and down the river, and hat is the reason it has been a little difficult for me to work hat out.

Q. Did you really have in mind that this characteristic wave f yours could persist mile after mile with front and back slope s steep as you stated?

A. In view of the fact there is very little channel storage in his river, and with the slope as steep as I had in mind, that it as more or less, without such a great reduction.

Q. When you said you estimated these angles at 10 to 15 de-rees from the vertical, you say you had a mental picture from hich you were working. Is that right?

A. A mental picture of a hydrograph.

Q. A hydrograph is platted with distorted scale, isn't it?

A. Yes, sir; that is what I mentioned, it may be a very istorted scale.

Q. If you have had in your mind a mental picture of a hydro-raph with different horizontal scale, say twice as long, would ot the slope have appeared perhaps 25 or 30 degrees from the ertical in your mental picture?

A. The larger the scale base naturally the wider it would ap-pear on the hydrograph.

337 Q. So that a mental picture from a hydrograph, with distorted scales is a rather unreliable basis for determina-on of slopes of front and back of waves?

A. Not for a good engineer, because the very first thing you sked me about this matter, I said that looked flat, and I looked ight there and it goes from 100,000 to 250,000, and that immedi-tely gave me a picture right there.

Q. Now, Colonel, in your opinion how long would it take, in ours, for your characteristic waves in passing Glen Lyn to in-

crease from its minimum or trough to its maximum of eight or nine thousand second feet?

A. Now let us look at the front slope of our wave—between seven and eleven, from peak to toe, in four hours.

Q. Four hours?

A. Yes, sir; there were four hours. Now if it came down exactly like that, and if the rate of discharge and the rate of travel were exactly the same at which it came out of the plant, then it would go by in about that time.

Q. Wouldn't you think that the rate of travel would be something on the order of perhaps four miles per hour?

A. Let us figure. I said 2½ to three days, say three days or 150 miles, that is 50 miles a day, dividing that by 24, gives you a little over two miles an hour.

Q. Don't you think each wave would travel faster than that in the upper part of the river?

A. Yes; I gave you an answer of 2½ or 2 days.

Q. I want to get the miles per hour. Wouldn't your waves travel on the order of two or three miles an hour?

A. No; the fastest part of travel is through the gorge, there is no question about that.

Q. Colonel, I am talking about the wave at Glen Lyn, wouldn't it be three or four miles an hour, or three, say?

1338 A. No, sir. There is a peculiar thing about a wave.

Q. All right, would it be 2½ miles an hour?

A. I said roughly, two, a little over two would be my guess of it, that is, of the mass, that is not of the peak, the average of the whole mass, the peak pours over and pours over and rolls over the bottom of the river.

Q. Then during the four hours that it would require for your wave to pass from its trough to the peak of its amplitude at Glen Lyn it would travel something like ten miles, or be something like ten miles long?

A. Something like that; that is not bad.

Q. You said you thought this wave would have an amplitude of stage at Glen Lyn of around five feet, didn't you?

A. That is what I said, over eight thousand cubic second-feet discharge.

Q. If you were to lay off a vertical slope of 5 feet on a basis of 10 miles, what slope would you get?

A. A very flat slope.

Q. And you would get a slope over 89 degrees from the vertical, wouldn't you?

A. You are talking about the waves in the stream and not the waves of the hydrograph?

Q. I am talking about the wave in the stream.
A. That is an entirely different thing.
Q. We have a wave in the stream that is ten miles long?
A. More like 40 or 50 miles.
Q. From the trough to its peak?
A. Something like that.
Q. And 5 feet high, and according to your estimate that gives you a slope of something less than a degree from the horizontal, does it not, or thereabouts?
A. I would have to work that out, but I don't think it
1339 makes any material difference exactly how.
Q. But it would be on that order?
A. It would be a very flat slope.
Q. Very flat?
A. Yes; that is it.
Q. The total length of the wave would be something around 50 miles or better, wouldn't it?
A. You say if it went down three days, it would be about 50 miles—No, it would be three-fourths of 50 miles.
Q. Then it would be 37½ according to your computation?
A. Something like that. That would not be so bad.
Q. Colonel, in your opinion, on what does the extent of these oscillations at the head of the reservoir depend?
A. I will try to repeat my explanation. As the wave enters the reservoir it causes the upper end to tilt above horizontal. Take Bluestone, about five feet and in that position it is acted on by what would be the force of gravity at the head and by the momentum of the movement and with a large volume of water, 8,000 acre feet, which is in that wave.
Q. In a fashion that is more simple to me, am I right in understanding that in your view the extent of such oscillations depends upon the amplitude and stage of the incoming waves?
A. Theoretically yes, because it is oscillation—that is what it amounts to. You get a great oscillation in the upper end of Bluestone because the upper end comes to a feather end, as I have stated before, and you do not get such a big oscillation further down the river because it is deep, it is this upper feather end that is doing the oscillation.
Q. Your so-called characteristic or typical power wave will pass Glen Lyn with an amplitude in volume of about 8,000 second feet?
A. Acre feet.
Q. Acre feet?
1340 A. Yes, sir.
Q. I did not understand it was amplitude in acre feet.
A. You said volume, but you mean acre feet.
Q. No, I mean second feet.
A. You are thinking about the discharge.

Q. I am talking about the amplitude of waves, measured in second feet.

A. You mean in discharge, yes cubic feet per second, something like that.

Q. And amplitude in stage, equal to 5 feet?

A. Yes.

Q. And that the oscillations start from a point 5 feet above normal elevation of reservoir and extends to a point 5 feet below normal elevation. Is that right?

A. Approximately.

Q. That is a swing of about 10 feet?

A. Yes, sir.

Q. Does this oscillation go up and down vertically or does it travel horizontaliy?

A. I think this will express it The condition of a body of water going in a wave, going into the reservoir, it goes into the reservoir at an appreciable velocity for a mass of that kind, and as it goes down—it does not stop there—and if the stage of the river is up above low flow; the point of rest of the reservoir is not horizontal, it is that governed by the tipping of the reservoir above, so your oscillation is above and below that point of rest line.

Q. The point I want to get at is this: Does the oscillation just move up and down in the upper end of the reservoir, or does it move horizontally along the reservoir?

A. The surface of the water in the upper end moves up and down. The actual volume of water that comes in and
1341 shoves that which is there at the beginning and it comes in and sinks down. The water coming in behind the wave is all cut off, except that below the trough and it comes in slowly, and I think that might help to get the picture. There is a big volume moving this way (indicating) and then the tail end of it is very small in volume, coming in. If it is moving that way, there has got to be something to fill up this space where this volume moves down or out.

Q. Will this 5 foot oscillation travel downstream to the reservoir, or not?

A. It depends on the depth just how far down it would go.

Q. At Bluestone would it travel down through the reservoir?

A. It would affect the entire length, the deeper you get, the less effect you have.

Q. Would it travel to the lower end of the reservoir, or not?

A. The effect would go there, yes, you would get oscillation there.

Q. When oscillation gets down to the lower end of the reservoir, what happens to it?

A. In a dam like Bluestone, where it cannot spill over the top like it does on the lower river, the oscillation going through would rise slightly above that of level and then swing back.

Q. Would it turn around and go back up the reservoir?

A. Yes, sir.

Q. When this wave or oscillation reaches the dam at the lower end of the reservoir, would any change in the stage be reflected in the gauge at the lower end of the reservoir?

A. Yes; that is true.

Q. That is, if this oscillation travels down through the reservoir?

A. Yes, sir.

Q. And is the effect the piling up against the dam at the lower end of the reservoir?

A. Yes, sir.

1342 Q. That condition should and would be reflected in gauge readings above the dam?

A. Yes.

Q. Now what do you mean when you say the gauge readings would be rising above the dam on downstream end of reservoir, and what would happen at the upper end of the reservoir?

A. That depends upon the period of oscillation, if it is exactly one day, if it is less, why the answer would be different and if it is more the answer would be different. Of course, my answer is for only one single day, one wave. I did not try to paint any worse picture than is necessary. I simply took one day. Now you have got five successive days. It is just like you sit a child in a swing and you give it a little push and it goes so far, then it comes back, and you give it another push, and it goes a little further and then it comes back and then you push it until it gets away up.

Q. Is it your opinion that simultaneously with your expected rise in gauge height at the downstream end of the reservoir, there would be a drop in gauge height at the upstream end of the reservoir?

A. It would be lower.

Q. That is, simultaneously with the increasing gauge height at the downstream end of the reservoir?

A. Yes; of course, that depends on the curve of oscillation of reservoir and when this big momentum comes in you can have a picture of that, if it is short oscillation and is not transmitted back up it may be at a different period, but only what you would expect, down at the upper end and up at the lower end would be the logical movement.

Q. In your opinion, would the change in gauge height at the downstream end of the reservoir, and the change in gauge height

at the upstream end of the reservoir be the same on the first trip of the oscillation down the reservoir?

A. That is what you would expect.

Q. What do you expect?

A. That is what I think as a general thing, and I have a
1343 wonderful illustration, but I cannot use it, on another stream. I have a wonderful illustration that gives a perfect picture, for I know what I am talking about, it just simply does that and that is all there is to it.

Q. Then as I understand you, it follows that by means of reading the gauge at the downstream end of reservoir one would get a pretty definite idea of the vertical extent of oscillation, about which you have testified?

A. Yes; you should get a good appreciation, because my experience is that they swing back that way below horizontal. One dam I had in mind, it was almost two feet below horizontal, and there was that much water gone out, it had to do that.

Q. What is your estimate of the period of time it would require for your oscillation on the Bluestone reservoir to travel down to the dam at the downstream end and back?

A. As I stated in my direct testimony, the rate of travel of the rise in stage from the upper end of the pool, is at the rate of 20, 40, to 60 miles an hour, depending on the depth. The length of the pool is about 30 miles long, so I guess it would get down there, that is, the first part of the wave would get down there in about an hour, and as the peak of the wave came up, it would get there in about an hour, so when the bottom of the sinking comes down or really when you are at the lower end about an hour later, you would have the maximum at the lower end.

Q. What did you mean when you said it would take about a day for the oscillation to make the trip down the reservoir and back?

A. You are mixed up there. I said if the period of oscillation were exactly one day. You see the idea. If the period of oscillation were exactly one day, but I didn't say it was that.

Q. In your opinion the period of oscillation is something on the order of half an hour or an hour?

A. Let us not get mixed up about the period of oscillation with the rate of transmission of the rising stage. That is wave action, that is without changing horizontally, the stage
1344 simply travels there, in other words, an hour after the point of this wave enters the upper end of Bluestone reservoir, you feel it down at the lower end—you see the point—and then it comes along and an hour after the peak up here gets in, it is down at the lower end.

Q. When does it come back, if it does?

A. It will come back depending upon the period of oscillation of reservoir, I don't know what it will be.

Q. You don't know what that will be?

A. No, sir. When I had this excellent experience, I think it was about three or four hours, or something like that, I am not sure, but we can look it up on the chart.

Q. Is there any change in this oscillation on its first trip down and back?

A. I do not know.

Q. You do not know?

A. No.

Q. Do you know whether there will be any change on its second trip down?

A. Let me explain it this way: I have explained already that if a child gets in a swing and you give it a push it goes so far, then it swings back and you give it another push and it goes further, and then another push until it swings very high. In that case the period of oscillation is identical in harmony with the pushes. It would require a period of oscillation in the reservoir to be at exactly one day. Is that enough? If not, I can tell you what will happen in one day.

Q. Go ahead.

A. If it is not quite one day, each successive wave will go a little further, then reach the maximum and come back, then be almost zero and then later it will go to the maximum.

Q. Do these oscillations gradually dampen and die out?

1345 A. As long as you continue the pushing and pushing every day, no. If it is not the same period of oscillation as the wave that comes in and as I said before, they will start in and get up to the maximum and come back to zero, then up to maximum and then back to zero. You see what I mean?

Q. No; I am not clear as to what you mean by that—do you mean that these oscillations will not gradually dampen and die out?

A. Yes, if no more waves come in.

Q. Am I correct in understanding that you think that no factor other than the head of incoming waves is of material importance in determining the extent of your amplitude of your oscillation?

A. Let us not forget two forces acting upon it, and I will repeat them again, gravity, due to the head of this wave tilted up, plus the momentum of the mass of the moving volume of the water.

Q. They are reflected in their amplitude at stage, are they not?

A. No, this is a different thing. You have got this head and you have got this volume.

Q. How are these two conditions reflected in the physical characteristics of the waves?

A. In the physical characteristics of the waves?

Q. Yes, sir.

A. Just what do you mean? Will you explain that?

Q. You said there were two forces involved. I want to know how they are reflected in the physical characteristics of these waves?

A. Oh, you can work them out. If there is a certain amount of energy and that energy goes ahead and it does not let it stop, when you get to the point of rest, if it were not for this moving body of water, which is energy after all, when you get to the point of rest, it would stop, but it does not rest when you reach that point, because it is going so fast it just cannot stop,
1346 just like an automobile coasting down one hill, it will coast up a part of another.

Q. Does the stage at which waves move make a difference in the oscillation stage of the incoming wave?

A. It has to do with the velocity of the traveling mass, the height of wave and the velocity.

Q. Suppose you had the same volume in waves but one was coming into one reservoir with a stage of 5 feet and the other one was coming in the identical reservoir with a stage of three feet, would that made any difference?

A. You would have to work out the momentum which is the velocity times the volume, plus the head, with the force of gravity acting on it.

Q. Wouldn't you know just by the mere fact that there is a difference in stage, with the volume the same and the reservoir the same, that there would be a different result or effect?

A. No; that is not necessarily the case. You take one situation, it will be one foot and in the other it would be five feet.

Q. That is true, but I am talking about the effect on the reservoir. Does it make any difference then what the stage is, in determining the extent of oscillation of stage of the incoming waves?

A. My experience is it goes about as far below as it was above.

Q. But if you had two incoming waves, one stage at five feet and the other 2½ feet, you would expect to have a different effect, wouldn't you, or different oscillation?

A. I would expect, if I did not have any other information, the one at 2½ feet would go that far below the point of rest and the one at 5 feet would go 5 feet below the point of rest.

Q. But in your opinion, does it make any difference whether the power wave flows into a relatively small reservoir like the Marmet pool on the Kanawha River or into a relatively large reservoir such as the Bluestone reservoir, as it is proposed to be?

347 A. In my opinion it would make no difference whether it was a small body or a big body of water, when the first ave hit it; when the oscillatory wave hit it, it may make a ifference.

Q. Will you distinguish between the two waves?

A. In a small pool it would be shallow and——

Q. One minute, you described two waves, one the oscillatory ave and the incoming wave and I want you to distinguish etween the two?

A. The successive waves would perhaps better express it. Where you have successive waves coming in, you might not get he same result in a small pool as in a deep one, but the first one o get there would be about the same.

Q. I am still not clear what the difference is between the oscil-tory wave and the other kind of wave you mentioned, according o your definition?

A. I used two terms.

Q. Please define each.

A. The oscillation at the upper end of the pool——

Q. Is that the oscillatory wave?

A. That is the oscillation of the surface of the pool. Let us ot confuse the waves, because the stage received transmitted ack and forth by wave action. That is one thing, that is not ave action, that is oscillation. The oscillation of the pool and he oscillation of the pool back and forth of this surface and hat not. Let us not mix that up with the wave——

Q. Is that what you called the oscillatory wave a while ago?

A. No, I think you misunderstood me.

Q. Didn't you use the term oscillatory wave?

A. Maybe I did, but what I wanted to say was that these uccessive waves which come in each day point into the upper end f the reservoir da, after day, day after day, day after day, so you see they are two different things.

348 Q. Incoming waves coming in different days?

A. Yes; I am talking of day after day, day after day, hen the wave comes in.

Q. I understood you to say a moment ago it did not make any ifference in your mind what would be the size of the reservoir nto which for instance, a wave of 5 feet stage should be pro-ected. Is that right?

A. Yes.

Q. Colonel, do you think if a 5 foot wave was projected down he Detroit River into Lake Erie, the 5 foot wave would run hrough Lake Erie and over Niagara Falls?

A. My answer is if the water went into Lake Erie in a chan-el just like that in the upper end of Bluestone, my answer is yes.

Q. That is, the five foot wave would sweep down Lake Erie 60 miles wide and 250 miles long?

A. One minute, it would sweep down this channel.

Q. Do you mean you would have a 5 foot wave of the same width sweeping across Lake Erie for some 250 miles over to Niagara River?

A. No; but we have this channel at the upper end of the feather edge of Bluestone Pool and it is going that way.

Q. As I understand you, it does not make any difference how big a reservoir is that this wave comes into?

A. Let me tell you——

Q. One minute, if this wave comes in Lake Erie it will make a sweep of 5 feet high through Lake Erie. Is that what you say?

A. It is not physically possible for you to pour a wave into Lake Erie unless it goes in a channel something similar to this one in Bluestone, because you are going to get oscillation in that section just like the sea waves on the shore of Lake Erie.

1349 Q. Then it is your opinion that this 5 foot wave would persist across Lake Erie?

A. No; I didn't say across, I said in this channel. I didn't say all the way across Lake Erie, no, it is in this channel, just as I have explained to you, in the upper end of Bluestone. You have seen a wave oscillating on the beach.

Q. Don't you know if you had an incoming wave into a large reservoir or large lake, that it would dissipate differently than if it came into a small reservoir?

A. Not unless the oscillating effect I have stated that affects it as a channel, etc., in which it enters, and they are oscillating back and forth. That is what it amounts to. If you take the deeper dams on the lower river the same momentum does not make them go so far, does not make them rise so far, and they do not go down so far.

Q. Let me ask you this question: Does the rate of increase in stage at Glen Lyn due to this incoming power wave that you have described, have anything to do with the nature or extent of oscillation?

A. No; as I will repeat again, and as I have repeated over and over again, it is the force acting on this wave, which will tilt it up, and the momentum of the moving mass, and you must remember this is not a wave washing in like a big high foaming wave from the ocean, but it has great length, which extends along about 9 or 10 miles long; you see what it is?

Q. If a sharp crested wave, due to rain, and resulting in increase in gauge height of 5 feet at Glen Lyn appears, do you believe that it would be followed by a lowering of the height of

the Bluestone reservoir by 5 feet, or an oscillation of a total amplitude of 10 feet.

A. If it was suddenly cut off, so there was nothing to fill
1350 up this space where this wave goes down it is still traveling at a nice old speed, when she hits the point of rest. It is the same thing, because if there is no water following along to fill it up, it is going right down. That is just what happens and is the experience I have had with dams, and down they go.

Q. Colonel Watkins, assuming that we have a wave with an amplitude in flow of 8,000 to 9,000 second feet, and in stage an amplitude of five feet, that it entered the upper end of the proposed Bluestone reservoir, when that reservoir was at normal pool level, and that this flow of 8,000 or 9,000 second feet continued at that rate forever. When, if ever, would the upper end of Bluestone pool recede below normal pool level?

A. It would stay up there forever. If the water kept flowing into it, it would stay there, because that is what our gage shows—a discharge of that quantity.

Q. Assuming a wave of that amplitude in second feet and stage continued to flow at a uniform rate for ten hours, and then gradually decreased for five hours, to 5,000 second feet, when, if ever—and then continued at 5,000, when, if ever would the upper end of the pool recede below normal pool level?

A. The wave is coming in 8,000 or 9,000 cubic feet—it makes no difference?

Q. And continues.

A. That represents a certain thing on the gage. That is the point of rest, as long as there is 8,000 going in there.

Q. Suppose at the end of ten hours, it began to decrease gradually and over a period of five hours decreased to 5,000 second feet and continues at that rate?

A. Yes. Now, the point of rest—take five feet—suppose that
1351 was 8,000 and say the point of rest for 5,000 was 2½ feet; that is the point of rest there. Then the drop cut off due to the cut off in the flow from eight to five thousand would cause an oscillation as the tail end came into the pool, if you picture that slope as a volume of water that cut off like—like that one is. It comes and sinks into the reservoir, and it would cause it to oscillate the difference between—the total oscillation would be about five feet and from 2½ above the point of rest to 2½ below.

Q. If you had a volume flow of 9,000 second-feet coming into the upper end for ten hours and it gradually decreased slowly over a period of five hours, until it got to 5,000 second-feet, and continued on indefinitely?

A. Yes, sir.

Q. The pool would dip below normal level, would it?

A. It would dip below this 2½ foot stage, which is the point of rest.

Q. When, if at all, would the pool dip below normal level?

A. If the normal point of rest is zero flow or near zero flow. For the 8,000 flow, with a five-foot stage, and if the 5,000 flow gives a 2½ foot stage, and you change from the eight thousand to the 5,000; when that change enters the reservoirs you fall to the stage where you expect the 5,000 to rest, and you go 2½ below it. That dip would be about to the horizontal and would swing back, due to the fact that the point of rest is the 5,000 stage, which is 2½ feet.

Q. It is your opinion that, as the flow into the reservoir was reduced gradually and uniformly over a period of five hours, from a flow of 10,000 second-feet to a flow of 5,000 second-feet, that there would be oscillations below normal pool level?

A. No. I said below the point of rest of this 5,000 second-feet flow. That is the discharge point of rest of 5,000 second-feet to which they reduced it.

Q. As a matter of fact, wouldn't the situation be, as you slowly and gradually reduced to the stage that would have prevailed—strike that—as a matter of fact, wouldn't the situation be that, as you slowly and gradually reduced the inflow from 10,000
1352 to 5,000, your stage would slowly and gradually reduce to the stage that would have prevailed to establish a flow of 5,000 second-feet?

A. If you went down very, very slowly, you could possibly—the result would be—no matter how slowly you stopped your rate there approaching 5,000, there would be some sinking below, but within the period of these waves here, which we have here, it is almost a perfect measure about as much below as above, and I have a chart showing both for certain stages, but I cannot show it. It measures it perfectly.

Q. Just as you could reduce gradually from ten to five thousand second-feet, so as not to produce a dip, you could reduce from there to zero so slowly and gradually that you would not produce a dip?

A. It is not within the range of these waves.

Q. It could be done, could it not?

A. No, sir; it is not within the range of the report gotten up by the power company.

Q. I am talking about engineering principles?

A. All right.

Q. Isn't it a fact that, if you cut off from ten thousand to five thousand gradually over a long enough period of time and from

Five to Zero, over a long enough period of time, there would be no dip?

A. There will always be a dip when you change from lowering from Eight to Five Thousand—there will always be a slight dip below it.

Q. No matter how slowly it is?

A. Theoretically there will always be a slight dip when you change it.

Q. If you decrease that slowly enough, you could not measure that dip, could you?

A. No, sir; but that is not within the range of reason of the waves.

1353 Q. It is one of those things, your attempt to measure the dip under these circumstances—would be like one of those things where you approach infinity and never reach it?

A. You would be getting away out of the range of our measurements——

Q. Of your knowledge of what?

A. Getting out of the range of anything which we are going to measure. You come here and send this great wave down and it raises the river away up above normal and as fast as it can go down, it follows on and follows the river on down. It will go down and that is all there is to it. When you start the wave at Radford and tried to hold it and spread it out the tail would come in and you would still get the wave formed in natural shape and it will sink.

Q. Have you finished, Colonel?

A. Yes, sir.

Q. Well, now, in view of this theoretical discussion of principles that we have been talking about—the effect of a very slow reduction in flow, I want to ask you: Suppose that the flow out of Radford station were not cut off abruptly, but instead were cut off very gradually, so that the wave would gradually grow less and less in height as it passed Glen Lyn, would that effect the amplitude or stage of oscillation in feet?

A. I will go back to what I have been saying all along—you turn water loose into the river and it is going to form into a typical wave, if you allow it to travel long enough. That will form into a typical wave if it travels long enough.

Q. Answer my question. Read the question. (The question is read). Answer "Yes" or "No."

A. You asked if it would. I said it would form a typical wave if it goes far enough; you will get the same result. We have a very good answer in the tests made at Buck and Byllesby.

Q. State whether or not under the assumed conditions in your opinion—the oscillations would be the same or would be

1354 increased or would be reduced, and I am willing to take your answer?

A. My answer is that the wave would probably be practically a typical wave when it reached there.

Q. No matter how slow the cut-off was at Radford, the oscillation would be the same?

A. If it was spread out over two or three places, it would not go into its typical shape until it got to Kanawha Falls. Those tests showed that, whether you turned them in slowly or for long periods of time, by the time they got to Radford, they were just about the typical wave. At Buck or Byllesby, at Radford or at Glen Lyn, you find about the same thing. They are about typical when they get that far, no matter which way you turn them loose.

Q. You stated that the extent of the vertical oscillation at the lower end of the reservoir will be measured by gage readings at the lower end?

A. Yes, sir.

Q. Is it not true also that the vertical extent of your oscillations at the upper end of the pool, would be measured by the gauge at the upper end of the reservoir?

A. I don't get you?

Q. If you have a gauge at the upper end of the reservoir?

A. Yes.

Q. Oscillations should be reflected in that gauge reading, should they not?

A. They should be reflected in the gauge readings; it is measured; that is not only reflected, but it is measured.

Q. You have testified that you are familiar with the so-called wave tests made by the defendant, with the co-operation of the Federal Power Commission, the Chief of Engineers and the Geological Survey, in 1930?

A. Yes.

Q. Did you examine the gauge records made by the representatives of the U. S. Engineers department in connection with

1355 these tests, to ascertain whether there were any important pool oscillations at that time?

A. Where was this?

Q. Sir?

A. Where was this?

Q. At dams 2, 3, 4, 5 and 6 on Kanawha River?

A. No, sir.

Q. You did not examine those?

A. I don't recall that. I do recall that there were rises in the upper end of the pools. If these dams operated—I forget as to—if it was operated at a fixed crest—both old and wicket dams.

Q. Did you find any record of oscillations in these records of wave tests in 1930?

A. The results I saw were the discharge measurements and I forget whether or not there were heights; I forget all the details of it.

Q. Did you find any records of gauge heights made by the engineering office in connection with this 1930 test, which revealed or showed any important oscillations in those pools on the Kanawha River—any of the kind you mentioned?

A. Well, if they showed any effect of the wave there, you know you have it.

Q. Do you understand the question?

1356 A. Yes, sir.

Q. Did you find any gauge readings on these pools that revealed oscillations of the kind you talk about, and I am referring to the records made of the 1930 wave tests?

A. I certainly found data for one of the pools that showed oscillation.

Q. You know what a gauge record is?

A. Yes, sir.

Q. And you know what I mean when I ask you whether or not you found any gauge records made by the Army officials in connection with this 1930 test or tests, and whether they showed any oscillations in the pools on the upper Kanawha; you know what I am talking about?

A. I did not look at the gauge records, because what I wanted to see was the results. That is what I was looking for.

Q. You were so confident there were oscillations revealed in the gauge heights, that you did not trouble to look?

A. The mere fact that there was a discharge, or change in discharge, shows that. The fact that it registered a discharge over the end of the pools shows there was this oscillation; in other words, it could not have been otherwise. There was this change; this persistency in the wave going along.

Q. If there was an oscillation in the pools, it will appear in the gauge records, will it not?

A. It did apparently, or they would not have given us these discharges.

Q. If there were oscillations in the stage there, they will appear in the gauge records?

A. I would like to see these things over there [indicating].

Q. I am talking about the oscillations in the stage?

A. Yes, sir; that is what I am talking about.

Q. If there were oscillations in the stage of these pools on the upper Kanawha, they will appear on the records of the gauges, will they not, Colonel?

1357 A. They will appear on the records of the gauges. And they will show as waves, like anything else. They will show as a wave.

Q. I can see that from the records. In your examination of any records made by the Engineering Department, in connection with the 1930 wave tests, did you find any time when the pools dip below normal pool level?

A. These 1930 tests?

Q. Yes.

A. I did not go into all of the details of this study. I certainly looked into the results in order to see what the general idea was and did not go into details. If I am not mistaken, those tests were made in the higher stages. Maybe I have forgotten that. If so, then there would have been no dip below horizontal, but would be a dip below the point of rest, depending on the discharge.

Q. You say if there was more than low-water flow initially and an abrupt cutting off of the wave up river, it would not produce a dip below pool level?

A. It would not produce a dip below pool level. If for example, when the wave came down, there was a discharge of 12,000 second feet in the pool before the wave approached and then, when the wave came along, and raised it to 15,000, and dipped it to 9,000—up to—I said from 12,000 to 15,000, then when it went back to 12,000, it would not stop at 12,000, but would go to 9,000 and then come back.

Q. I understand that you are responsible for the dashed lines on exhibit 117?

A. Yes, sir.

Q. And the colored areas?

A. Yes, sir.

Q. Do you have—it extends to the upper end of Winfield pool as you show it—what oscillation do you show there?

1358 A. During my direct examination, I said that this chart [indicating] gave a pictorial view of it and a pictorial view of these oscillations. Now——

Q. Do you mean it is not attempted to be plotted accurately to reflect your estimate?

A. It is not attempted to be plotted accurately or perfectly because I did not have the data to adjust it more and I did not take the trouble to change it because it is for pictorial purposes.

Q. I want to know, taking Winfield pool, what oscillations you estimated there, as revealed on this exhibit?

A. May we have our rating curve?

Q. What do you mean?

A. I mean on here—I said this was pictorial view. You can read it in the record. The object of this is to show the oscillations and that happens to be zero.

Q. You show a certain oscillation above and below the normal pool level?

A. Yes.

Q. What do you estimate the extent of that oscillation to be for the Winfield pool?

A. My estimate is shown on these rating curves.

Q. If you know, tell me?

A. I would rather read it off the curve; not just guess at it.

Q. Is that an exhibit to which you refer?

A. Yes, sir. I suppose so. They were the famous curves turned in here that caused so much attention.

Q. That is Government Exhibit 117-a?

A. I don't know what it is.

Q. We will get the official exhibit and see. (Papers are handed to witness.)

A. Yes; 117-a, it is called, all right. Now, shall I
1359 measure the wave that I assumed was an average wave—3,300 c. f. s. flow at Radford?

Q. Tell me first what you estimate the extent of the oscillation at the upper end of Winfield pool to be?

A. In my direct statement, I only estimated it as about one foot above and below in general for all dams. I did not go into details of each dam.

Q. You estimated the oscillation to be one foot above and below normal pool levels?

A. That is about the general average—the average annual flow at Radford.

Q. Tell me how and upon what basis you arrived at this swing of one foot?

A. I assumed the discharge of the wave when it arrived at this part of the river at between 6 and 7,000 c. f. s. With 3,000, that would be above and below 12,000 c. f. s.; that is, it gives a difference in discharge—that seems to be .4.

Q. That is 0.4 of a foot?

A. Yes, sir.

Q. That would be the rise?

A. On this curve—the oscillation—that is a rise of about 0.4.

Q. Tell us the route as you go along so we can follow you?

A. That is approximately 0.4 of a foot—no, wait a moment—let me try again. Now, that should read—there is 0.8 and here is 0.6—that is 0.8 of a foot, if I am correct.

Q. Tell us out loud how you got that 0.8?

A. The 6,000 c. f. s. wave is that nice little conservative wave I was talking about that left Radford. I did not try to exaggerate it or overdo it; I did not try to over-persist it. That provided about 70% and it may be higher.

1360 By Mr. THOMPSON:

Q. Where?

A. To the lower level.

Q. Of what?

A. The Radford wave when it gets to the lower river.

1361 By Mr. JACKSON:

Q. At which place?

A. Winfield.

Q. You are using government exhibit 117a for this purpose?

A. Yes, sir.

Q. What particular curve are you using?

A. I used the London dam. So I gave the result for London instead of Winfield. I thought it looked funny.

Q. Anyway, give the name of the curve appearing on Exhibit 117a?

A. Government Exhibit 117-a is what they call it.

Q. But what curve on there?

A. I am using the one extending from the elevation of the crest of the dam that goes to the slope there.

Q. You are using the one labelled London lower pool with Marmet in place?

A. That is not exactly in the line. That is the one I am using.

Q. That is the one with the broken legend that I read?

A. Yes, sir.

Q. How did you get the oscillation for the Winfield pool?

A. I took the Winfield curve.

Q. That is what one?

A. Just a moment; Look nine in Winfield; 12,000; go up 3,000; go down to 9,000—nine from twelve is about what—that goes up one foot.

Q. You are looking at what exhibit?

A. I am looking at Exhibit 117-D, I believe.

Q. And which curve were you reading from?

A. I was reading from this curve.

Q. From the upper curve which is entitled——

A. "Lower pool minimum elevation."

Q. "Lock No. 9, normal upper pool?"

A. No, that is the normal upper pool of lock No. 9.

Q. But from the upper curve on Exhibit 117-d?

A. Yes.

1362 Q. Don't you know, Colonel, that that curve isn't even for Winfield?

A. This says "Winfield site, average open river," and this says "The lower minimum elevation."

Q. Don't you know that that curve is for the Gallipolis pool?

A. Lock No. 9 and Winfield. It says "Winfield site, average open river." We have another curve that shows the Gallipolis dam.

Q. Then anyway it is your testimony that the upper curve on Exhibit 117–D is the curve for Winfield and, whether it is or not, that is where you got your estimate for the Winfield dam of the swing of oscillations of the Winfield pool; it that right?

A. No, let us not confuse it. These curves are the rating curves at the upper end of the pools below each of the new dams and not the upper end of the pool of the dam. In other words, each measures the fluctuation of the pool of the dam below it. It measures the fluctuation of the upper end of the pool of the dam below the one.

Q. In other words, the upper end of the Gallipolis pool?

A. That is correct.

Q. And you have applied that to the Winfield pool?

A. No, I have applied it to the Winfield dam, that is below the Winfield dam, the oscillations below the Winfield dam.

Q. Just to summarize this matter, you got your estimates of amplitude of oscillations in feet above and below normal pool level for all the pools shown on your Exhibit 118 by use of the curves appearing upon some one of the exhibits 117–A to 117–F, inclusive?

A. Those rating curves are the oscillations of the pool below each dam. That is the way they are designated there.

Q. I merely want to know if you got them from reading those rating curves on Government Exhibits 117–A to F, inclusive?

A. Yes.

Q. But that conclusion was coupled with the assumption that the drop below pool level would be the same as the stage
1363 above pool level just before the flow began to be reduced; is that right?

A. Yes.

Redirect examination by Mr. THOMPSON:

Q. Colonel, on your cross examination you were asked with respect to the normal operation of the power project at Radford. State from your experience as an engineer and your knowledge of the Radford project whether it would be normal operation to limit the peaking operation of the Radford project plant to less than the installed capacity of the plant?

By the COURT:

Q. Didn't you say that in substance at least a dozen times?

A. Yes, I think I have, sir.

By Mr. THOMPSON:

Q. Colonel, you were asked about the operation of the Bluestone project and I believe that you referred to a 308 report where it showed that it would be operated on a basis of a minimum discharge of 2,000 second feet?

A. Yes.

Q. And you understood all of the time when you were testifying there that this project would be operated under the orders and control of the Federal Government, did you not?

A. That is right.

Q. Do you understand that the regulated flow, or did you understand when you were testifying, that the regulated flow of 1,230 second-feet to be the hypothetical flow that would result from combining stream flow and draft from storage over the low-water period?

1364

A. That is a hypothetical average low flow, as I have explained. It would go up and down.

Q. It was hypothetical as you understood it to be?

A. Yes; average. That doesn't mean it is going to be continuous.

Q. State whether or not the actual flow would vary from 1,230 second-feet, according to the operation of the power plant, between the limits of zero and 9,000 second-feet?

A. It would, due to peak-load carrying and reservoir operation.

Q. You were asked at some length with regard to the plans that are set forth in the 308 report with respect to the Bluestone. Counsel has attempted to show that the Bluestone and the lower power plans are planned for use as peaking plants. Does this recommendation of the 308 report represent a matured plan or a preliminary recommendation, suggesting a possible plan?

Mr. JACKSON. I object to the question. It calls for a conclusion to be determined by the Court, and I don't think the witness has any basis for answering the question.

Mr. THOMPSON. He has testified he has studied these plans carefully and he has expanded on them.

Mr. JACKSON. He doesn't even know their capacity or anything about them.

By the COURT. He may answer.

A. They are outline plans. They are not supposed to be the final plans at all.

By Mr. THOMPSON:

Q. On your cross-examination you testified with respect to the waves that would come from the Radford project down into the Bluestone. When the water comes down from the Radford project will it not come in a compact body?

A. It will come down in a wave typical of that of New River.

Q. And when it reaches the dam site, that is the pool of the Bluestone, state whether or not it will gradually spread out?

A. It will submerge into the upper end of the pool, so to speak.

Q. In the question of navigation between the Radford
1365 project and the pool of the Bluestone project, assuming that the Bluestone is completed, what is it that you consider, the effect of the wave as it enters the Bluestone pool or the wave as it has been dissipated in the Bluestone pool?

Mr. JACKSON. I object to that. He hasn't testified anything about that subject. There has certainly been no cross-examination about any question of navigation.

Mr. THOMPSON. He testified as to how navigation would be affected in coming down that river or going up the river between Radford and the Bluestone.

The COURT. He may answer the question.

A. I consider the large mass of moving body of water which sinks into the pool as it goes in and not the whole surface of the pool but the mass that sinks into the upper end.

By Mr. THOMPSON:

Q. You were asked on cross-examination, or you testified about a wave that might increase in volume as it went down the stream and you were asked by counsel if you could show such a situation or condition. During the recess did you locate such a condition, and, if so, where?

A. With the assistance of [indicating Mr. Gerdes]:

Q. I hand you a yellow paper here upon which you made some figures.

A. Yes. According to this the March 12th wave was 5,000 at Ivanhoe and 5,100 at Allisonia. March 13th it was 5,000 at Ivanhoe and 5,200 at Allisonia. I have seen a little better information than that but I don't know just where it appears in the report. It appears in some of the tables also and some of the data that accompanied the report.

Re-cross examination by Mr. JACKSON:

Q. What is the mileage between Ivanhoe and Allisonia, Colonel?

A. We can get them off the chart.

Q. It is about 24 miles?

Mr. THOMPSON. About 20.

By Mr. JACKSON:

Q. About 21 miles?

A. Something like that. If the figure is important I will be glad to get it.

Q. Just approximately is all, and what is the mileage to Radford dam site—46 miles?

A. Can't we take it off of a curve? We have got plenty of profiles and things here. We can take it accurately. Why testify
1366 from memory on something that doesn't amount to a row of beans. Take it off of that.

Q. Is 46 miles about right from Ivanhoe to Radford dam site?

A. 39 miles is seems to be from Ivanhoe Gaging Station. The Radford project is 89 here and 129 at the gaging station on this chart.

Q. And how many miles from Radford dam site to Bluestone or Glen Lyn?

A. To Glen Lyn?

Q. From the Radford dam site?

A. At the upper end here is Glen Lyn, miles 93.9 and Radford is miles 151—57.1 miles, or something about like that.

Q. And will you read from your paper what was the amplitude of the same wave in second-feet at the Radford dam site?

A. I didn't get it from Radford dam site. The wave of Buck and Byllesby on the 12th was 4,350 when it reached Radford. The wave that left Buck and Byllesby on the 13th was 4,400 when it reached Radford in cubic feet per second.

Q. You measured those from the trough or head of the wave or following it?

A. That was from the trough in back of the wave.

Q. And when you measured the waves on the 12th and 13th up at Ivanhoe and Allisonia, did you measure from the trough ahead or back of the wave?

A. Back of the wave. It was measured from the back of the wave and if we had measured it from the front of the wave it would apparently have been somewhat higher.

By the COURT. Is it possible to give in a brief answer, in language that would be intelligible to a nontechnical person, what is meant by this report when it speaks of power that may be generated on New River, where it says you may generate 450,000 primary HP and as much as 1,500,000 primary peak HP? What is the difference between them? And it says a 30% load factor. I also would like to know that.

By the WITNESS. As I understand the report, your Honor, the 451,000 is the prime power that you can secure all time of day and night, and all the year around, due to regulation of the reservoir.

By the COURT. I thought that was it.

By the WITNESS. That is what that report means. Now then this other power that goes up to 155,000 was drawn off of the duration curve when they worked the problem and took that block of power above that produced by assuming the natural flow, the wheels would take it out of the natural flow, at that height.

By the COURT. When you speak of primary HP you mean the amount of electricity that can be generated steadily through—that held in the reservoir, supplemented in the stream, the forces being used together you can generate that much HP?

By the WITNESS. That is right, that is you can produce that twenty-four hours a day, day and night.

By the COURT. What do you mean by load factor?

By the WITNESS. The load factor is the ratio of the average of the power per day to the total of the demand. For instance, if you will remember that chart, where the load varied from approximately one hundred thousand to two hundred and fifty thousand. If you work out the average let us say it would be about one hundred and twenty-five thousand probably, something like that, or a little higher, because I believe the load factor is actually 60% load factor.

By the COURT. I can see now it is a figure which has a relation between the primary peak HP that can be generated with reference to the primary power that is there?

By the WITNESS. Yes, sir, that figure in the 308 report about the load factor is the proportion of time this duration curve extends across the face, the primary power it is a little different to what we ordinarily call that. That is about what it means or amounts to.

By Mr. JACKSON. I have already cross-examined the Colonel about that, so I am not going to ask the Court to submit to that again, but it is our understanding he was entirely in error in his interpretation of primary peak HP, and I merely mention that so the Court will understand.

By the WITNESS. Frankly I don't know that term there.

By Mr. THOMPSON. Colonel Watkins has gone over his testimony, and as your Honor knows it has been very technical, and he has a number of corrections to make, and he wants to leave tomorrow. I don't know what to do about it, whether counsel on the other side will agree to the corrections or not.

By Mr. JACKSON. We would have to see them before we would know that.

By the WITNESS. May I show it to them?

By the COURT. When I adjourn you may go over it with him.

By Mr. THOMPSON. May I at this time offer in evidence a document I have had marked for identification Government's Exhibit #191, being the Kanawha Valley Power Company license for project #1175, West Virginia. That includes the London and Marmet dams, and they have been under discussion, and testimony today on them today, and I want to at this time introduce them. This is a subsidiary of the Appalachian Electric Power Company. This is the license to the Kanawha Valley Power Company from the Federal Power Commission.

By Mr. HORN. That isn't a subsidiary of the Appalachian Power Company.

By Mr. WILLIAMS. Affiliated.

By Mr. THOMPSON. I want to present it and offer it in evidence at this time.

NOTE.—Exhibit filed and marked "Government's Exhibit #191."

1867 JOHN R. DOUGLASS

Direct Examination by Mr. THOMPSON:

Q. Will you please state your name to the stenographer.

A. John R. Douglass.

Q. Where do you reside?

A. Point Pleasant, West Virginia.

Q. How long have you resided at Point Pleasant, West Virginia?

A. About ten years.

Q. Where did you reside prior to that time?

A. At Buffalo, West Virginia.

Q. Where is Buffalo, West Virginia?

A. On the banks of the Kanawha River.

Q. Have you ever been active in any work on the Ohio River?

A. Yes, sir.

Q. And on the Kanawha River?

A. Yes, sir.

Q. How long or how much of your life have you spent on these rivers?

A. Well I started as clerk on boats, carrying freight and passengers on the Kanawha, between Gallipolis, Ohio and Charleston, West Virginia, when I was a boy, going to school, during vacation periods, commencing in the year 1898, and continued for three seasons.

Q. Then what did you next do?

A. After that I started on the river in 1915 as clerk on freight and passenger boats, between Cincinnati, Ohio and Charleston, West Virginia.

1368 By Mr. JACKSON:

Q. That commenced in 1915?

A. Yes, sir; and continued until 1918. During that period I was promoted to purser, who has charge of the finances and business of the boat, and in 1919 I transferred to an excursion boat, operating on the Ohio River with the home point at Point Pleasant, W. Va. The main part of the excursion business was at Pittsburg', Pa., although we made special trips up and down the Ohio River as far south as Cairo. I was purser of that boat up until 1923. I obtained license as first mate and was first mate on the boat standing the captain watch. The next year I obtained my master's license and took charge of the boat as master. I continued as master of the boat until the fall of 1928. During this time, in 1923, I obtained a pilot's license, and in 1929 I left the excursion boat and went into the towing trade, two tow boats, towing barges up and down the river. I have been engaged in that business ever since. I might state that my licenses are Master of Boats, of all tows, on the Ohio River and tributaries, and Pilot's license from Pittsburg' to Cincinnati on the Ohio, and Point Pleasant to Marmet on the Kanawha River, first-class pilot's license.

Q. How many trips would you estimate you have made on the Ohio River from Pittsburgh to Cincinnati, past the confluence of the Kanawha and the Ohio?

A. Well, I would be safe in saying more than a thousand trips, over a stretch of river between Cincinnati and the confluence of the Kanawha.

Q. How many trips would you estimate you have made up the Kanawha?

A. Better than six hundred possibly.

Q. I believe you said you lived at Point Pleasant?

A. Yes, sir.

1369 Q. In the summer season what is the condition of that river, in low-water time, in your early days on the Ohio River, how was that?

A. It got very low and navigation at times was completely suspended.

Q. Prior to the construction of the present series of dams that run to Cairo what was the condition of navigation in dry periods on the Ohio?

A. The River got very low and navigation would also be suspended on there, that goes down as far as Cincinnati. At that time below Cincinnati, I am not in position to state, although I have reason to know it was suspended there also.

By Mr. JACKSON. May it be understood all this testimony with reference to the Ohio River is received over our objection, with exception allowed in line with previous objections we have made, that there is no issue as to the Ohio River in this case, and particularly that there was no issue embraced within the pleadings in this case as to what was the condition of either the Ohio or Kanawha in earlier days?

By the COURT. Yes, sir.

Q. Since the construction of that series of dams on the Ohio during low water times, state if anything is necessary to be done to keep water in these pools so there can be navigation?

A. Do you mean during periods of dry season, during low water?

Q. Yes, sir; during low water?

A. It is necessary to caulk the dams to retain the pools at their proper levels.

Q. And is that done every season, or just occasionally?

A. Every season in periods of dry weather, however, if rains extend pretty well over the season sometimes, very little, if any, is done, but practically every season, and numerous times during the season.

Q. If the caulking and needling were not done, what would happen?

A. The drainage of the dam or leakage of the dam would be, these are movable dams on the Ohio River, and a space between each wicket, and the leakage through those places amount to more than the supply of water coming in, at the head of the pool,
1370 which would be the same as a leaky bucket with a hole in it, and someone pouring water in it, and not pouring in as much as was going out at the bottom, and eventually all the water would leak out of the bucket.

Q. Do you know where the Gallipolis dam is being constructed?

A. Yes, sir.

Q. Where is that on the Ohio.

A. That is twelve miles below the mouth of the Kanawha River.

Q. Now what is the character of the dams below the Gallipolis dam as to construction?

A. The dams below the Gallipolis dam are wicket type dams, or movable dams. They are lowered during periods of high water, when there is water enough in the river to enable boats to move without dams, or the depth of the river is sufficient that boats or tows will move without the need of dams and when the river gets below that these dams are raised to maintain pools large enough to move tows drawing nine feet of water.

Q. Do you have to caulk and needle these dams?

A. Yes, sir.

Q. What will happen when the Gallipolis dam is constructed, as to whether you will have to caulk and needle the dams below?

By Mr. JACKSON. I object to the question, the witness is a pilot, and has not charge of these dams, and isn't an expert on construction or operation of dams; that has been covered by engineers.

By the COURT. I see no objection to letting him answer.

By Mr. JACKSON. Exception.

A. The condition of the dams below the Gallipolis dam when completed will be the same as they were before the dam was built, and then unquestionably they will have to be caulked.

Q. And if they are not caulked will that interfere? I mean interfere with navigation.

A. The leakage will be the same and the pools will draw below the nine-foot depth, which we are supposed to have. That is navigable depth.

1371 Q. State whether or not from your experience on that river all the water that you can obtain or that can flow down into that river, that does flow down into that river naturally, is necessary for navigation during low water periods?

A. Absolutely. We need every drop we can get there in periods of very dry weather. When there has been rain fall, extended throughout the year, it doesn't mean so much, but in periods of extreme drought and lots of boats and tows moving, it is necessary to keep these dams absolutely tight, and even then sometimes the pools get what we call thin on the upper end.

Q. When you are navigating a boat up and down the Ohio or the Kanawha, how do you determine as to the cargo, the size of the cargo you shall take, and as to whether you shall advance up or down the river?

A. Well, if we are loading cargo to go downstream on the Kanawha, we look at the Government reports, showing the gage at Kanawha Falls, the amount of rain fall at Ivanhoe, Radford, and Kanawha Falls. If there is a little extra water in the river, probably they will be running a few wickets on their weir dams, passing some extra water, we may load to as much as seven feet, although six feet in the Kanawha River is the depth we are supposed to have, but this extra water we have going through will allow us as much as seven feet, but if the pools are down to what we call flat pool, that is the normal pool, and the gages for the points up the river don't show rainfall, and the river rising, we would be very careful not to load beyond six feet; and if the gage at Kanawha Falls reads zero and it has been dry for an extended point of time, and the pools are drained down, we have had to load less than six feet.

Q. Do you also have gages you read on the Ohio?

A. Yes, sir.

1872 Q. And do you read the gages at dams 25 and 26?

A. Yes, sir; we read the gages at each particular dam, as we go along, we read them religiously. These on the Ohio River, there is a bulletin board posted on the power house of the lock which sets up on top of the bank and that shows when the dams are up, shows the gage at normal pool, shows whether the pool immediately below is carrying a little extra water coming in which would naturally make the upper end of the pool a little higher, and if nothing has happened this pool is a few tenths low. Whether this pool will be under the regular pool level or not that all shows on this bulletin board, and we look for that as we come into each lock, so we will know the conditions.

Q. You follow this bulletin board information as to gaging depths very carefully?

A. Yes, sir.

Q. Have you ever found any of these gaging reports of the Government on the Ohio or Kanawha to mislead you?

A. No, sir.

Q. Do you know what the volume of commerce on the Ohio River is passing the confluence of the Kanawha and Ohio?

By Mr. JACKSON. I object to that, if it is material there are official reports of the Chief of Engineers that show just what that is. The witness could not make anything more than a guess, and that is objectionable, because if material there are statistics appearing in the reports of the Chief of Engineers that show just what that is.

By Mr. THOMPSON. I desire to show whether this business is increasing.

By Mr. JACKSON. It will be reflected in the annual statistics if it is.

By Mr. THOMPSON. I am surprised counsel wants to rely on any Government statistics.

By the COURT. I imagine it would be an estimate.

By Mr. THOMPSON. It is, yes, sir.

By Mr. JACKSON. Exception.

A. I could not say as to the amount of tonnage moving there. I could enumerate quite a number of boats or barges which are operating on the river, but I doubt if I could off-hand call to mind all of them, although I am familiar with those that work over that stretch of the river.

Q. State if that commerce is on the increase or decrease?

A. Yes, sir; every available pilot is operating between Pittsburg and Louisville, which represents practically the same thing as a division on a railroad. There are some pilots with license

extending from Pittsburg' to New Orleans, but most of the
1373 men operate on the through boats only from Pittsburgh to Louisville. All of the pilots operating between Pittsburgh and Louisville are at work, and are very hard to get. I had to go out as relief on a boat the day before I came up here on a boat on the way from Louisville to Pittsburg', and I got on the boat in the morning at eight o'clock, and went up the river that day to assist the crew up as far as I could to get back here the day I was supposed to arrive here.

Q. What is the condition of commerce on the Kanawha as to increase or decrease, if you know?

By Mr. JACKSON. Same objection and exception.

A. I could not answer as to tonnage, but all the boats, about all the boats, on Kanawha, are working and all the river men are working, and there is undoubtedly an increase in tonnage.

Q. I believe you stated that you took notice of the rain fall up at Ivanhoe and Radford, is that correct?

A. Yes, sir.

Q. Where do you get notice of that?

A. We get that from the Government Reports from the U. S. Engineer Office at Point Pleasant. There is a copy of this report at each lock.

Q. Is that given each day?

A. That is given daily. If we are not where we can contact with the Government office at Point Pleasant, we call the nearest lock and ask for it.

Q. Is the question as to whether there is a rain fall at Ivanhoe and Radford a matter that influences you one way or the other as to going up and down the river?

A. Very much.

Q. Will you give an illustration of how much and in what way?

1374 A. If we were up-bound——

Q. This is on the Kanawha?

A. Yes, sir; on the Kanawha, it makes more difference on the Kanawha naturally than it does on the Ohio, but it makes a difference on both rivers, that is if you are on the Ohio below the mouth of the Kanawha. If you are up-bound on the Kanawha River and you saw by the report that you were due to get a rise out of Kanawha River, which would mean the throwing off of the dams, you would be apt to cut your tow in half, and if it looked like the rain fall would mean that they would have to throw some wickets——

Q. What do you mean by have to throw some wickets?

A. Lower them so they would pass the extra water, and make current on the river, you would have to cut down your tow

materially, whatever current you meet impedes your progress and adds to the time in delivering your tow to its destination.

Q. Have you ever noticed the reports at Ivanhoe and Radford and then cut your tow?

A. Yes, sir.

Q. Frequently?

A. Yes, sir.

Q. And what does that mean in cost to you?

A. That means added time and expense of having the tow you have had to tie up hiring someone to take care of that while you are gone with the rest of the tow.

Q. Suppose it is a low-water condition?

A. A dry season?

Q. A dry season and you get word of a rain at Radford or Ivanhoe, let us say an inch, what effect would that have on you?

A. That would have the same effect—you would have to cut your town down materially.

1375 Q. You were referring to coming up stream. Now supposing you were coming downstream, what would the condition be?

A. Coming downstream you would have an extra current there, but not enough water to add to the depth of your tow, and you would have to navigate more cautiously owing to the current downstream. There are some very narrow channels down the river, usually at the head of these pools, and the bottom of the river is rough, and you have to be very careful in getting into those places, or you are liable to sink a barge or damage one to a very bad extent.

Q. Do you have any boulders in the pools of the London and Marmet dams?

A. Yes, sir.

Q. How is the channel in the London and Marmet dams marked, if at all, Mr. Douglass?

A. The critical places are marked with buoys.

Q. You speak of these tows, describe to the Court the size of the tows on the Ohio, that go past the confluence of the Kanawha and Ohio?

A. The size of tows on the Ohio River varies to the size of the boat towing it and the number of barges to the size of the barges being towed. I might state the standard coal barge on the Kanawha River is 135 x 26 feet, and is 9 feet depth. The standard coal barge on the Ohio river is 26 feet wide by 175 feet long and eleven feet depth. The standard Ohio river tonnage barge they call it, that is a covered barge they use in moving fabricated steel and other cargoes that need to be covered, to protect them from

storms, these barges are 35 feet wide, 132 feet long and 11 feet depth.

Q. What do they draw in depth when loaded?

1376 A. When they are loaded on pool stage to draw 9 feet, I am getting at the number of barges now in the tow, these tows will run from about six barges to fourteen and sixteen barges of either the 132 foot barges or the 175 foot barges.

Q. And what do these barges carry?

A. On the Ohio River they carry manufactured steel products, pipe, construction steel, nails, tin-ware, glass, matches, etc.

Q. What do they carry on the Kanawha River?

A. On the Kanawha River the downstream tonnage consists almost entirely of coal. Upstream it is gasoline, sand, gravel and builders' supplies of all kinds.

Q. What is the number of boats you carry in the tow on the Kanawha, or barges?

A. Six barges is considered a Kanawha River tow, although they tow more than that at times. It has been demonstrated that six barges is the most economical tow to handle on Kanawha River.

Q. What is the maximum draw you can risk on the Kanawha?

A. Six feet, that is flat pool water.

Q. When a tug is drawing the barge upstream and you have a draw of 6 feet, what is the actual depth you effect on the river?

A. Well upstream against current you will have better than seven feet.

Q. What would it be on the Ohio where you have a draw of 9 feet?

A. A draw of nine feet up there if there was current you would displace about 10½ feet.

Q. Have you ever noticed on the Ohio, contiguous to the confluence of the Ohio and Kanawha dredging being done at the back end of the pools?

1377 A. Shall I add to the answer of the question I just made the reason that is the case?

Q. Yes.

A. In moving barges through the water current coming against them, the water pushes up against the head of the boat and it sorter acts as a dam that pushed the water away from it, is why boats proceeding upstream will draw more water than a boat going downstream.

Q. (Question read.)

A. You mean the upper end?

Q. The upper end of the pools?

A. Yes, sir.

Q. Have you seen that on pool 25?

A. Yes, sir.

Q. Pool 26?

A. Yes, sir.

Q. And the other pools down the river, that is pools behind the dams, 26 and so on, down the river?

A. Yes, sir.

Q. State if that is a frequent occurrence, that is, the dredging behind or in the back end or upper end of these pools?

A. Yes, sir.

Q. Have you ever seen any dredging done at the upper end of the pools behind the dams on the Kanawha?

A. Yes, sir; more frequently on the Kanawha than the Ohio.

Q. And where?

A. Below lock 11, Kanawha River, and below lock 10 on the Kanawha River; and below lock 9 on the Kanawha River below Lock 7 on the Kanawha River; below lock 6 on the Kanawha River; below the Marmet Dam on Kanawha River, and below the London Dam on the Kanawha River.

1378 Q. How recently have you seen dredging being done below the London Dam and the Marmet Dam?

A. I saw dredging done below the London Dam the month of June 1935, and below the Marmet dam in the month of June 1936.

Q. Do you happen to know how high the silt had risen in the pool just below the Marmet dam at the time this dredging took place?

By Mr. JACKSON. I object to that. Nothing in the evidence to show the silt had arisen at all.

Q. What was the cause of the dredging below the Marmet dam, if you know?

By Mr. JACKSON. I don't see how he can know, unless by hearsay.

A. Partly because of silt deposited between the guide walls to the lower approach to the Marmet dam, and to improve the channel in the stretch below the approach to the dam, they widened the channel a little point about a half mile, or hardly so much, below the dam. They were widening the channel on the point below it.

By Mr. JACKSON:

Q. When was that?

A. This year, during the months extending from April 18th until June 28th.

Q. What was the depth of the silt there just below the dam site?

A. Well, I could answer it this way: the pool between Lock No. 6 and the Marmet Dam is supposed to be of a depth of 6

feet at present, and I saw two boats with coal drawing 6 feet stuck in the entrance to the lock and had to be flooded out with the valve from the lock to get them off this stuff.

Q. When was that about?

A. This was sometime in the month of June; I could not give you the exact date.

Q. How many barges did these boats have?

A. The steamer "Holley" had 6 barges—they were loaded with coal; the steamer "J. C. Robb" had 6 barges loaded with
1379 coal; the Diesel boat "Victor" had three loaded with coal. This was not all at the same time—it was different times.

Q. And it was about the month of June?

A. Yes, sir; but it did not happen on the same day.

Q. You said that you had seen them dredging just below the dam—the London Dam?

A. Yes, sir.

Q. What was the occasion of their dredging there?

A. They were removing silt—the silt deposit at the entrance to the lock; on the lower side of the Dam.

By Mr. JACKSON:

Q. In June 1936?

A. Yes, sir.

By Mr. THOMPSON:

Q. Did you have occasion to find out, or do you know how high the silt had risen from the floor of the channel there?

A. At London?

Q. Yes?

A. No, sir.

Q. What was the reason for the dredging of the silt, do you know?

A. The boats were having difficulty getting through there.

Q. What were those boats drawing?

A. Those boats usually draw in—9 or 10 feet. Those pools are higher there and the coal moving through there does not go below Marmet pool.

Q. And do you know what those boats were drawing?

A. No, sir; I did not see those boats.

Q. They were boats that were used in the 9-foot channel?

A. Yes, sir.

By Mr. JACKSON:

Q. What 9 foot channel?.

By Mr. THOMPSON:

Q. Between Marmet and London Dams.

A. Yes, sir.

1380 By Mr. THOMPSON:

Q. Do you know what the term "oscillation" means with respect to water in the pools?

A. Yes, sir.

Q. Did you ever see any oscillation in a pool?

A. Well, I have seen the water come and go real fast and fast enough to make it pretty tough for me piloting.

Q. Where was that?

A. Right under the Marmet Dam.

Q. What was the occasion?

A. I was working on a boat, working immediately below Marmet Dam. I was making a trip through the lock about every hour.

By Mr. JACKSON:

Q. When was this?

A. This was from April 18th, 1936, up until June 28th, 1936. I was making a trip through the lock about every hour, and it made it very difficult for me to catch myself going in and out of the lock. One time I would go in and there would not be any reaction there and the next time I would come up and go in and not expect any reaction, and there would be lot of reaction there, and sometimes it would hit the lock wall and break the lines, and so forth. I have noticed a variation of as much as 2 feet, extending over a period of 2 or 3 hours. In places where I would stop to turn my boat around, I might turn around this trip and not have any trouble and then be gone an hour and come back and hit the dam turning the boat around. I have had that to occur. It is rather dangerous hitting the rough bottom—you are liable to knock a hole in your boat and sometimes sink it. If you knock a hole in them, it means a trip to the ways or docks. It is very expensive.

1381 Q. State whether or not you have ever tied up at night and had experience with these oscillations or in a fog?

A. Yes, sir; in 1935, I was working just above Winfield Lock, and had a fleet tied up to the shore, consisting of 3 barges loaded with coal that we were using for fuel and a supply barge—the barges drawing about 4 feet. We were only working from 4 o'clock in the morning until eight o'clock at night. Of course, we were tied up after 8 o'clock at night. Very frequently we would get up in the morning and our tow would be stuck, owing to the river having risen suddenly and fallen suddenly during the night. These shores are not straight up and down. They differ as to contour and, as the river comes up, your boats will slide in against the shore. The problem is to first determine the shape of the

shore and if the shore is flat, they can get just so far, and if it is steeper, they can go in so far on the same amount of water. If the river falls, the inside edge is on the bottom and they are liable to be damaged if you are caught out on a log or rock, especially a wooden barge is liable to get a hole in it, and with the boat lying tipped up on its edge, if the wind was to rise and cause wind-swells, it gets the water sloshed up in the boat, and it will sink, or you will have to pull it to the shore and aim to keep it afloat, and that all takes time to do that, when you could be busy doing something else.

Q. Do you know where the oscillations that you refer to comes from?

A. That period it was dry weather and it must have come from the Radford Dam.

Q. You mean Marmet or Radford?

By Mr. JACKSON. He told you where it came from. I object to that.

By Mr. THOMPSON:

Q. You say it came from Radford Dam. There is no dam at Radford.

By Mr. JACKSON. I object to quarreling with your own witness.

By Mr. THOMPSON. I am not quarreling with him.

1382 Q. Do you wish to correct that statement, Captain Douglass?

A. Yes, sir.

Q. What dam do you refer to?

A. It must have come from the Marmet Dam or the dams above it.

By the COURT:

Q. Do you know the height of the Marmet and London Dams?

A. The locks there are 360 feet long and they are 56 feet wide. There are two locks at each dam and both the locks are the same size.

By Mr. THOMPSON:

Q. Give the names of the firms that operate barges up and down the Kanawha River and the number of barges they have.

A. Yes, sir; about the largest operator on the river is the Hatfield-Campbell Creek Coal Company; they have 5 tow boats and about 200 barges; the Raymond City Coal Company have 2 tow boats and about 50 barges; the Kanawha River Company have 3 steam boats and one Diesel boat; all of the boats that I mentioned are steam boats and one Diesel boat and about 60 barges.

Q. 60 barges?

A. Yes, sir. The Ohio River Coal Company has one steamboat and about 6 barges; the Ohio River Dredging Company have one boat and about 6 barges; the boat is longer, because they operate 6 barges up and down the river; Captain C. C. Stone has one steam boat, one gasoline boat, one gasoline barge, and three coal barges; there are two sand and gravel companies at Charleston—we will combine them—two different companies—they have 4 tow boats and about 50 barges; the Standard Oil Company 1 tow boat and 6 barges; and a man named
1383 Shearer—I forget his initials—4 Diesel boats and about 10 barges; the two sand and gravel companies at Huntington operate 2 tow boats up the river at different times—we will say that they use 16 barges. That is most of the boats and barges used on the river. There are a few small ones possibly and some gasoline boats, and so forth.

Q. Are these companies active on the river, moving traffic constantly?

A. Yes, sir.

Q. How far up the river is 9 foot navigation at the present time?

A. It starts at Lock No. 6 and extends to the mouth of Loop Creek on Kanawha River.

By the COURT:

Q. It extends where?

A. Loop Creek.

By Mr. THOMPSON:

Q. Where is that with reference to Kanawha Falls?

A. It is about 3 miles below Kanawha Falls.

Q. As to a navigator, what is the most necessary conditions on the river for navigation?

A. An even amount of water.

Q. An even flow?

A. An even flow—stage of water.

Q. And sudden rushes of a quantity of water or cutting it off is the most troublesome, isn't it?

By Mr. JACKSON. We object to that as leading.

By the COURT. Yes; but he may as well answer.

By the WITNESS. May I answer?

By Mr. THOMPSON. Yes.

A. It adds to your difficulties, not only in navigating, but also as to loading. If you know you are only going to have 9 feet, you only load to nine feet. If you were sure you would have as much continuously as 10 or 11 feet, you could load to that, and you could move the extra tonnage at about the same price.

1384 Cross examination by Mr. JACKSON:

Q. If the Government would provide you with 15-foot channel, instead of a 9-foot channel, you could move a larger load?

A. Yes, sir; what I mean by 10 feet is open river. We didn't have that at the locks—the pool stage.

Q. That is, the deeper the navigable depth, the larger the loads that you could move?

A. Yes, sir.

Q. And within certain limits, the larger load you could move more cheaply per unit—it can be moved more cheaply per unit?

A. Yes, sir.

Q. And I suppose the navigators generally like for the Government to make the channel as deep as they will, don't they?

A. Naturally, yes, sir.

Q. That is a matter of personal interest with them?

A. Yes, sir.

Q. What is the name of the company for which you work?

A. The last company I worked for was the Union Barge Line. I am in the employ of the Government.

Q. Oh, you are in the employ of the Government?

A. Yes, sir.

Q. I didn't understand that you made that statement in your remarks about your experience. When did you enter the employment of the Government?

A. In 1929.

1385 Q. And you have been in the employ of the Government ever since, have you?

A. With the exception of one year.

Q. What year was that?

A. Well, from November 1933 until February 1935.

Q. Now, before you went into the employ of the Government, you were in the employ of the Union Barge Lines?

A. No, sir.

Q. What company were you with then?

A. Before I was with the Government, I was with the Excursion Line of boats from Pittsburg with the Ohio and Mississippi Ferry Transit Company of Evansville, Indiana, and the last people I worked for—I will have to sort of lead up to this to get where I did start working for the Government.

Q. Maybe I can help you—now, from 1923 to 1929, you were with this company that ran an excursion steamer up and down the Ohio River?

A. Yes, sir.

Q. Was that the "Homer Smith?"

A. Yes, sir.

Q. And it plied between Pittsburg' and down river points?
A. Yes; we were not running separate excursions.
Q. And in 1929, you say you left the excursion business and went into the towing trade?
A. Yes, sir.
Q. What you mean is you went into the Government's employ?
A. No, sir.
Q. Did you go into the Government's employ in 1929?
A. Yes, sir; but I went to work for the Ohio and Mississippi Transit Company at Evansville, Indiana, towing from Evansville to Pittsburgh, after leaving the "Homer Smith."
1386 Q. How long were you in the towing trade before going into the employ of the Government?
A. I was only there the latter part of August, I believe, 1929.
Q. And you left the "Homer Smith" sometimes in the Spring or Summer of 1929?
A. No, sir, I left the "Homer Smith" in October 1928.
Q. And you commenced that towing business about what time in 1929?
A. About March.
Q. So that your experience in towing—in the towing business was, or towing trade, as you call it, was from March until October 1929?
A. Up until I went into the Government service.
Q. That was August 1929?
A. Yes, sir.
Q. When you went into the towing business, you were getting most of your loads at Pittsburgh, were you?
A. At that time; during the time I was with the Ohio and Mississippi Transit Company, it all originated at Pittsburgh.
Q. It all originated at Pittsburgh?
A. Yes, sir.
Q. So, that your loads in each instance, were picked up at Pittsburgh and taken down the Ohio to Evansville, or to some intermediate point?
A. To Evansville where we turned it over to others.
Q. When did you get your pilot's license—in 1929?
A. No, sir, I got my first issue of a pilot's license in 1926, I believe.
Q. Now, your pilot's license entitled you to act as a pilot on the Ohio River from Pittsburg'?
1387 A. They do.
Q. What?
A. The first issue of a pilot's license that I got only went as far as Rochester, Pennsylvania.

Q. From Pittsburgh to Rochester, Pennsylvania?
A. Yes, sir.
Q. How far is that?
A. About 30 miles.
Q. And eventually you worked up to the point where you got a pilot's license from Evansville to Cincinnati?
A. Yes, sir, and to Marmet on the Kanawha.
Q. You could not, however, act as a pilot below Cincinnati?
A. No, sir, and I am not yet.
Q. I understand. Your license on the Kanawha authorizes you to act as a pilot up the Kanawha as far as Marmet?
A. Yes, sir.
Q. You never obtained any extension of that license?
A. Yes, sir.
Q. So, today and at all times, you were not authorized to act as a pilot further up the Kanawha than Marmet?
A. Yes, sir; I said yes. Can I make an explanation of that?
Q. Not now, you can in a moment. To the extent, if at all, you undertook to act as a pilot into the Marmet and London pools, you were not piloting, except that you were working for the Government?
A. Yes, sir.
Q. And the Government does not observe the restrictions which are imposed on its licensees for pilots, when working for the Government?
1388 A. There are occasions when they work a man over a piece of river that he don't have a license for, if they feel that he knows the river.
Q. Well, in all your past experience as a pilot, you never navigated the Kanawha River further than Marmet?
A. No, sir.
Q. So it was not on the basis of your past navigating on the Kanawha River as a pilot that the Government concluded that you were an experienced and competent pilot through the upper waters?
A. Yes, we—I worked there with a dredging boat with another man and took the boat up and back, and in working over the pools, they considered that I had enough experience.
Q. And they gave you a trial?
A. They considered that it was safe to entrust me with the boat.
Q. That was not on the basis of your past experience as an operator and pilot?
A. Yes, sir.

By Mr. THOMPSON:

Q. It was?

A. Yes, sir; I had made trips with another man up there with a dredging boat and had worked over the critical points while dredging, and with the experience I had, they thought it was safe to entrust me with the boat.

By Mr. JACKSON:

Q. You said on direct examination that you went in the towing trade in 1929 and had been in that business ever since. Is the Government in the towing trade on Kanawha River?

A. We do towing.

Q. What did you say?

A. With the Government's tow boat. I don't tow for anybody else. We tow for the Government.

1389 Q. The more correct statement would be that the Government has been engaged in construction work on the Kanawha River?

A. Yes, sir; but we tow equipment. We do the same work in moving. It don't matter if the barge is loaded with building material or with matches, if it is drawing 6 feet of water, it takes as much skill to get it up and down the river, as if it was feathers.

Q. I will not argue that with you, but the fact is that what towing you have done since you have been in the employ of the Government has been in connection with the Government's construction work?

A. And general maintenance and repair work. I beg your pardon—the summer that I was not working for the Government, I was working for the construction company and towing sand and gravel up as far as Winfield; the boat was drawing 6 barges of sand and gravel. I was about to forget that.

Q. I am glad you remembered that. How far downstream is that from London and Marmet?

A. It is about 40 miles below Marmet.

Q. I understood you to say that the navigator is interested in being able to rely upon the expected navigable depths in the channel?

A. Yes, sir.

Q. And is it a fact that, as long as the pool above and the dam is full, there will be the expected or project navigable depth above the dam in that particular pool?

A. No, sir.

Q. Why not?

A. If there has been extra water coming into that pool and it is suddenly cut off, the head of the pool will thin down.

1390 It will build back up, but for the time being it will thin

down. I had experience with that on the Ohio and the Kanawha Rivers.

Q. As long as the pool is maintained, so that there prevails the project or expected navigable depth throughout its length, then the condition is satisfactory for navigation, is it?

A. Yes, sir; absolutely.

Q. So that the only question, from the standpoint of navigation, within at least reasonable limits, is being able to rely upon the finding of expected or project depth throughout the pool?

A. Yes, sir.

Q. You spoke something of the possibility of disadvantage through a rapid change in pool levels, which I presume would be accompanied by a rapid change in current velocity. Is that right?

A. Yes, sir.

Q. Suppose that a pool gradually rises above project level at an elevation—I mean at a rate of—oh, say, one-half of a foot an hour. Would that gradual rise of navigable depth have any particular effect on navigation?

A. Yes. In certain stretches of the river, it would not have much effect.

Q. Well, take——

A. (Interrupting.) But stretches where the channel was narrow, it would add materially to the current and to the difficulty of navigating the tow and keeping your boat in the channel. These channels, are not all straight. Some of them are crooked. That is why the current adds so much to your work.

Q. Take a pool such as London or Marmet, would a slow rise in the stage above the normal level of the pool have any appreciable effect?

1391 By Mr. THOMPSON:

Q. What is a slow rise?

By Mr. JACKSON:

Q. Say, at the rate of half a foot an hour?

A. Well, at the rate of half a foot an hour, it would bother me considerably at the mouth of Paint Creek.

Q. Where is Paint Creek?

A. It comes in about 3 miles below London Dam.

Q. You could not observe any rise if you were on a barge in a pool such as Marmet or London—you could not detect a rise as slow as half a foot an hour, could you?

A. You could not tell how fast it was rising, but you could soon find out that something was playing the devil.

Q. How?

A. Your boat would flop around and you could not make any time up the stream.

Q. There would be an appreciable difference in the current. You have that in mind?

A. Yes, sir.

Q. Naturally, in all rivers there are numerous changes in the stage, are there not?

A. Yes, sir.

Q. Some of these are quite slow and some are rapid.

A. Yes, sir.

Q. That is the normal and usual conditions that you encountered in the navigation of any river?

A. Yes, sir.

Q. And any competent pilot has no difficulty in navigating under these conditions, does he?

A. Sometimes it adds to our difficulties, but we navigate under those conditions.

Q. No competent pilot regards it as any particular difficulty or problem to meet a slow rise in the stage of any river, does he?

1392 A. He may not admit it, but he can say to himself that he wishes it was not there.

Q. It would be simpler if it was a perfectly still pool?

A. It would not be so much work, and he would be sure of what he was doing.

Q. Do you know what the velocity flow is of London and Marmet pools?

A. No, sir; I have seen it in Marmet pool so strong that it was all I could do to tow one derrick boat with the boat rated up to 500 horsepower.

Q. To tow it where?

A. Upstream.

Q. Where was it in the pool?

A. I was towing—I moved it there—We started at Marriette, Ohio, and moved the tow and derrick boat into the old Lock No. 3, just below the mouth of Paint Creek, where they were going to do some work moving some stuff from the edge of the channel.

Q. Were there any oscillations there at the time?

A. No, sir; this was due to natural heights.

Q. It was due to flood?

A. Yes, sir—no, sir; it was a natural rise—not due to flood.

Q. Give the date of that?

A. About May 1935.

Q. You were towing that up there to work?

A. Towing it to old Lock No. 3.

Q. Was old Lock 3 in place?

A. No, sir; it had been removed, but we were going there to work at this channel above old Lock No. 3.

1393 Q. Did you to as far as Marmet?

A. Lock 3 is in the Marmet pool above Marmet. We came all the way up the river.

Q. Was Marmet Dam completed?

A. Yes, sir.

By the COURT:

Q. You said that, due to a rise of half an hour, that you would have a great deal of trouble in the river and mentioned the mouth of Paint Creek. What is the reason you would have trouble there?

A. It is a narrow place in the river and, due to the shape of the channel, the current runs crosswise in the river there. It comes in at that point on the opposite side of the river and veers across the river in the mouth of Paint Creek and there is a bar below Paint Creek and it shoves you towards the bar and you have to stay off that bar and this tow is pretty heavy, you know.

Q. What is the shape of this bar?

A. It is down stream diagonally across the shape of the river bed. When your speed upstream is retarded, it impairs your steerage.

By Mr. JACKSON:

Q. What is the current of Marmet and London pools at low water flow?

A. I don't know.

Q. Tell me what the difference would be in the current of London and Marmet pools in low water flow conditions by the gradual rise not exceeding half a mile an hour?

A. Not exceeding half a mile an hour?

Q. I mean half a foot per hour?

A. I could not state it—what difference that would make, I cannot say—how many miles per hour.

1394 Q. Do you think it would make one-fourth of a mile per hour?

A. Yes; I would think it would make more than that.

Q. You don't know that it would make that much, do you?

A. I feel sure it would make that much, but we would not in navigation judge that by miles per hour. We judge it by force—how much force it will be against the boats and what effect it is.

Q. But I want some check on your judgment.

A. I am sorry.

Q. I am asking you to give me something definite to check on. What is the greatest velocities against which you navigate in Kanawha River?

A. Eight miles an hour.

Q. Where is that?

A. It occurs at different points on the river. You encounter it at the mouth of the River and you encounter it at Knobs Shoals and Red House, just below Lock 6, and at Hawks' Chute.

Q. Does the change from one to one and a half miles an hour bother you?

A. Yes, sir; materially.

Q. How about from one to one and a fourth?

A. You will readily notice a change of a mile an hour.

Q. But I asked you about a change from one to one and a half an hour?

A. Yes, sir; you will notice changes from one mile to a mile and a half an hour.

Q. And from one mile an hour to one and a fourth miles an hour?

A. When it gets to a change of a quarter of a mile an hour, it is not very distinguishable. You can feel it, but it does not make a great deal of difference.

1395 Q. It requires a man looking for trouble pretty hard to detect a difference between a mile an hour and a mile and a quarter an hour.

A. In starting the boat, you usually meet a certain amount of current, and after a bit, you have to pull your rudders over a mile further.

Q. When you go up and down the river, do you find the current uniform throughout the length of the river?

A. No, sir.

Q. It varies from section to section?

A. Yes, sir.

Q. Under all conditions, it varies from section to section?

A. Yes, sir.

Q. And any competent pilot has got to take that into consideration in navigating any river?

A. Yes, sir.

Q. What do you mean by oscillations?

A. Sloshing back and forth, I take to be the meaning of the word.

Q. Captain Douglass, you were sitting here in Court listening to the testimony of Colonel Watkins, yesterday—I mean Friday.

A. Yes, sir.

Q. Did you know anything about oscillations before you heard him testify?

A. Yes, sir.

Q. You understood then, just like Colonel Watkins explained them, before he testified?

A. Certainly.

Q. And you used, from time to time, to go down the river and say, "We are striking oscillations at pool No. 6"?

A. We never used the word "oscillations."

1396 Q. What did you use?

A. We used "Rise" and "Fall."

Q. You strike a rise and fall in any river trip that you ever made, do you?

A. Yes, sir.

Q. For any length?

A. Yes, sir, but these falls and rises that I was speaking of were due to the rapid cut off in the dam at Marmet.

Q. Did you ever observe oscillations in the Ohio River?

A. No, sir.

Q. You never observed oscillations in the Ohio?

A. I never noticed any sudden falls in the—I beg pardon; that was the wrong answer. I have noticed them on the Ohio due to running traps in the Ohio, and they would suddenly shut them off and cause the same condition.

Q. Running bear trap dams, you mean?

A. Yes, sir.

Q. So your experience throughout your operations on the Kanawha River is that there were oscillations on the river?

A. I had experienced the sudden rises and falls. I did not call them oscillations in our terms.

Q. You don't know whether they were oscillations or not, do you?

A. No, sir; I could not say they were oscillations. All I could say, they were sudden rises and falls.

Q. They were changes there in the stages that you observed on the river?

A. They were unnatural changes in the river.

Q. You know they were unnatural changes?

A. Yes, sir.

Q. Did you observe unnatural changes in the stages throughout your experience on the Kanawha?

1397 A. Yes, sir.

Q. And that began in 1898?

A. Yes, sir; they used to run splashes from the head of Kanawha to Cincinnati.

Q. On the Kanawha River, you observed what you thought were unnatural fluctuations on the river?

A. Yes, sir.

Q. When was the first time you navigated up the Kanawha River?

A. I learned the Kanawha River the first season I was a package boy or clerk, just when I was a kid.

Q. In 1898?

A. Yes, sir.

Q. And from 1898 on, you observed the annual fluctuations or stages of the river?

A. Yes, sir; when they would be doing something with the dams above there.

Q. Those unnatural fluctuations you observed may have been caused by the operation of the dam.

Q. From 1898 on you observed not merely the natural fluctuations at the mouth of the river, but you observed the unnatural fluctuations and stage up the Kanawha River?

A. I think they would be doing something with the dam above

Q. Oh, these unnatural fluctuations that you observed, were, or may have been caused by the operation of the dam.

A. They were caused by the operation of the dam.

Q. That is, those were the navigation dams you are talking about now?

A. Yes, sir.

Q. You said on your direct examination that there were certain wicket dams on the Ohio River?

1398 A. Yes, sir.

Q. And there have been wicket dams on the Kanawha, haven't there?

A. Very few.

Q. There were even more a few years ago. Is that right?

A. Yes; there was only one more, no—two more.

Q. Did you ever know of a wicket dam that did not have to be caulked from time to time or needled, during low water seasons?

A. No, sir.

Q. Isn't the very theory of a wicket dam that it will be caulked and needled during low water season?

A. I am not engineer enough to know a whole lot about the theory of them, but in working out they are all needled and caulked.

Q. So that if someone told you that there was a slack system of navigation on the river, which locks and wicket dams, you would expect that from time to time these wicket dams would have to be needled and caulked during low water, wouldn't you?

A. Yes, sir.

Q. There is nothing unusual about that, is there?

A. Not in extreme dry weather.

Q. Furthermore, you would expect, if those wicket dams were not needled caulked during low water flow, the pools would fall below normal pool level, wouldn't you?

A. They undoubtedly would.

Q. You also said that you had observed dredging in the upper end of navigation pools, did you not?

A. Yes, sir.

Q. You have observed that yourself on the river, haven't you?

A. Yes, sir.

1399 Q. And from your experience on the river, you would know that any suggestion that a navigation pool might be maintained indefinitely without dredging it at the upper end, would be ridiculous, wouldn't it?

A. Yes, sir.

Q. And did you ever see any dredging in the upper end of pools, back of the dams on the Ohio River upstream?

A. You mean at the upper end of pool?

Q. That is right.

A. Yes, sir.

Q. You have seen dredging at the upper end of every pool on the Ohio River, above the mouth of Kanawha up to Pittsburgh, haven't you?

A. Practically every one of them.

Q. That is nothing more than normal maintenance condition you would expect to find on any navigation project that was made up of locks and dams or slack water, isn't it?

A. Yes; but I might add it happens oftener in the Kanawha than in the Ohio.

Q. And of course, it will happen oftener on some other river if it carries more silt?

A. Yes, sir.

Q. The question of how much dredging has to be done from time to time, is in general the function of the silt carrying capacity of the stream, isn't it?

A. Yes, sir.

Q. The depth available to navigation at the head of the pool on a slack water development, depends on how deep you want to dredge the upper end of pool, doesn't it?

A. Yes; how deep they want to dredge it, or the height they build their dams.

1400 Q. The depth at the upper end of pool is dependent on how much they desire to dredge the upper end, for given height of dam?

A. They are usually built—I am not an engineer, and I don't want to go into this technically, but they usually build their dam,

and they figure it is cheaper to do some dredging on the upper end of pool than it is to build the dam higher and naturally the water being thin at the upper end of pool and they have to have some deposit there and they have to dredge.

Q. If they built the dam higher, they would have to dredge as soon as the silt has gone far enough. Is that right?

A. Yes, sir.

Q. And from that time on it will become a maintenance proposition any way?

A. Yes, sir.

Q. Mr. Douglas, you testified that when you were navigating on the Kanawha River, you observed rainfall records at Ivanhoe. Is that right?

A. Yes, sir; we took the records for Ivanhoe, Radford, and Kanawha Falls.

Q. Can you tell me of one such instance where you were loading and where you were going?

A. We were going upstream with a tow?

Q. From where?

A. From Marietta, Ohio—wait a minute—I will go back to 1934.

Q. But I do not want any of these government operations.

A. That is what I am getting at.

Q. I want you to tell me of one of these instances when you were navigating the river, not for the Government, but as a private operation before 1929, where you loaded and where
1401 you were going when you observed these rainfall records at Ivanhoe. You said Marietta. Do you want to change that?

A. Yes; I am going back to when I was working for the railroad contracting company, hauling sand and gravel.

Q. Now when was that?

A. This was in the summer of 1934.

Q. But I want you to go back to 1929, when you were in private operations.

By Mr. THOMPSON:

A. He said he was in private operations then.

By Mr. JACKSON:

A. I am asking him to go back of 1929.

Q. Give me an illustration before you went with the Government?

A. I was not working on the Kanawha River before 1929, I did not have a license to pilot up there.

Q. You did not have a license to pilot up there before 1929?

A. No, sir.

Q. Then you never had a license to pilot on the Kanawha River until you went with the Government after 1929. Is that right?

A. Yes, sir.

Q. And you do not know of any instance, prior to the time when you went with the Government in 1929, that you ever in originating a cargo anywhere on the Kanawha River, observed the gauge heights at Ivanhoe, do you?

A. No, sir; not myself. I know of other people that have, of my own knowledge.

Q. Were you on the boat?

A. Yes, sir.

Q. Tell me one of those. I would be more liberal—give me one instance in 1929, before you went with the Government, of a trip where you observed the Ivanhoe gauge, the trip being on the Kanawha River, and tell me where the trip originated and where you were going?

1402 A. Wait a minute. I did not understand you to say Ivanhoe gauge, I meant the rainfall on the head of Kanawha River and the gauge at Kanawha Falls.

Q. You selected and talked about the Ivanhoe gauge, I did not.

A. As far as the habit of speaking of those gauges up there, that is a later thing, but going back to 1929, I would not be sure about what gauges we observed up there other than Kanawha Falls.

Q. Do you think that prior to the time that you were with the Government and heard so much about these gauges that you examined any reports of rainfall records above Kanawha Falls when you were loading on the Kanawha?

A. Yes; I think Radford was taken in then, and I was not navigating then and I did not check those things closely like now. I would hear a pilot talking about those things, but not being a pilot then, I did not pay close attention to what was being done or said at that time.

Q. Suppose you were loading a tow at Charleston to take it up as far as Lock #6, how long would it take to go up there or to make the trip?

A. From Charleston to Lock #6 is only three miles and it is downstream.

Q. How far above Charleston is the Marmet dam?

A. It is about nine miles.

Q. How long would it take you to take your tow there before the London and Marmet were built, that is, when you were operating from Charleston up to Lock #2.

A. I wasn't up that far prior to 1898 on a tow, but I have been up there myself.

Q. When you were sailing on Kanawha River, about how many hours did you make?

1402 By Mr. THOMPSON:

Q. Do you mean up or down the stream?

By Mr. JACKSON:

A. He can tell me.

A. We will take both ways.

Q. All right then.

A. It depends on the stage of the river, but a boat was considered fast that would average seven or eight miles an hour upstream.

Q. I am talking about a tow. That wouldn't go that fast, would it?

A. No, sir. It depends on the size of your tow upstream and also downstream as to what speed you would make, two to four miles an hour.

Q. Upstream or downstream, which?

A. About the same downstream, but that includes your lockage, and pool of water.

Q. Pool of water, you mean by that, water not moving?

A. The dams are up.

Q. What current are you assuming for that?

A. It would practically be dead current.

Q. Dead water?

A. Yes, sir.

Q. Suppose there was a current?

A. That would decrease your speed upstream. At places it would add to your speed downstream, and at other places it would take away your speed downstream.

Q. Going downstream, you would have to slow up?

A. Yes, sir.

Q. You couldn't take full advantage of the current?

A. That is right.

Q. When you were navigating on Kanawha River, and you saw there was an inch of rainfall up above Ivanhoe, what change
1404 in the gauge did you assume that would make on the Kanawha River, if you did assume any?

A. It would make some change in the gauge on the Kanawha River.

Q. How much?

A. About a foot.

Q. You assumed that would make a difference of about a foot?

A. Yes, sir.

Q. What did you know of the lag between the rainfall above Ivanhoe and that in the river at Charleston?

A. This would necessarily mean rain extending from Ivanhoe on down the river, not only at Ivanhoe but all over the watershed. Without that it wouldn't mean very much.

Q. You would assume rain over the entire watershed?

A. Yes, sir; at Ivanhoe, Radford, and Kanawha Falls and all down through there.

Q. You didn't know anything about the lag between whatever rainfall there might be above Ivanhoe, and down by Charleston, did you?

By Mr. THOMPSON:

Q. Do you understand what he means by the word "lag"?

A. I do not.

By Mr. JACKSON:

Q. Well, how long would it take for a rainfall above Ivanhoe to appear in the river below Charleston?

A. We figured about 18 hours.

Q. You now figure, or you did figure that when you were navigating on the Kanawha River?

A. When we were navigating on the Kanawha River, about 18 hours from the time of the rainfall.

Q. That is, if it was low water, it was your assumption that rain falling above Ivanhoe would appear in the river below Charleston in 18 hours?

1405 A. If the rain had extended all over the whole watershed, there would be an appreciable rise there in that time.

Q. If it rained at Charleston that water would appear in the river almost immediately?

A. From the time the water fell at Ivanhoe until it gets to Charleston, I couldn't tell you.

Q. And the fact is, that when you were navigating the river, you didn't have any idea about that, did you?

A. No, sir; we didn't take that into consideration.

Q. You did not take into consideration the question of water falling up above Ivanhoe as distinguished from all over the valley?

A. We took it into consideration, inasmuch as we had a rise in the river.

Q. It would tend to prolong any rise that occurred by reason of a general rain over the river. Is that right?

A. Yes, sir; it would add to it.

Q. You did not take into consideration the rainfall that was localized at and above Ivanhoe?

A. No, sir.

Q. You ceased navigating on the Ohio River, in 1929, didn't you?

A. Yes, sir.

Q. Were all the dams on the Ohio River constructed then, between Pittsburgh and Louisville?

A. Between Pittsburgh and Louisville?

Q. Yes, sir.

A. Yes, sir.

Q. And you acted as a pilot as far as Cincinnati?

A. That is all—no, I was Master.

1406 Q. As Master as far as Cincinnati?

A. I was Master as far as Evansville.

Q. Didn't you act as the Pilot at all there?

A. No, sir.

Q. You never have acted as a pilot on the Ohio River since you obtained your Pilot license. Is that right?

A. Yes, sir.

Q. Not on a commercial barge line?

A. Yes, sir.

Q. When?

A. I was piloting for the Union Sand & Gravel Company when I went to work for the Government, and I have piloted for the Ohio River Dredging Company, Keystone Sand & Gravel Company, and Dravo Contracting Company.

Q. On the Ohio River?

A. Yes, sir.

Q. But that is from Pittsburgh to Cincinnati?

A. No, I never have piloted a boat through from one continuous trip from Pittsburgh to Cincinnati.

Q. Then on what section of the Ohio have you piloted?

A. Most of my piloting was confined between say Ashland, Kentucky, to Moundsville, West Virginia. I do make and have made trips into Pittsburgh and Cincinnati, but that only occurs about once every year or once every two years.

Q. When you observed these rains on the Kanawha River, if they were of any size, you knew you were going to have to let the wickets down probably?

A. Yes, sir.

Q. And the result of that was you had to cut your tow in two?

A. Yes, sir.

1407 Q. And that increased your expense and loss of time. If there had been any way of preventing that greater increase so you would not have to cut your tow, it would have been better, wouldn't it?

A. Yes, sir; anything that would cut down the current of the river would be an advantage to moving the tow upstream.

Q. In your experience on these rivers, how much cushion did you allow below the loaded barge?

A. We worked down sometimes less than a foot, but a 9 foot barge, we like to have two feet.

Q. You would like to have a two foot cushion?
A. Yes, sir.
Q. That is, cushion when they are standing still?
A. Yes, sir.
Q. As I understand you the squat of a tow boat or barge in motion upstream is somewhere around a foot?
A. Yes, sir.
Q. And that will vary?
A. Yes, sir, it will vary.
Q. With the load?
A. And the amount of current. It will be more in swift current?
Q. And with the speed?
A. Yes, sir.
Q. And where you have a project that has certain controlling depths you frequently will navigate those controlling sections with a smaller cushion than you would if that were a uniform depth throughout the navigable channel. Is that right?
A. Yes, sir; but at some of these Ohio points in the pool you have less cushion there always, no matter what the depth is.
1408 Q. That is assumed, but what I mean to say is this: A navigator in whose judgment a two-foot cushion would be desirable, would load so that the cushion might be less than two feet, for short distances, of controlling depths, whereas he would not load to that small a cushion if there were no deeper water throughout the entire channel?
A. That is right.
Q. So that is in common experience in practicable navigation that you have a channel with certain relatively short controlling depths, isn't it?
A. Yes, sir.
Q. And it is common practice in that navigation to load your ship or barge so that for those short controlling depths there will be less cushion than you would otherwise be willing to navigate with?
A. Yes, sir.
Q. And the controlling depth in a waterway that is created by slack water navigation, depends on what plans may be adopted by the Government for that project, doesn't it?
A. Yes, sir.
Q. And whatever they are, navigation has to accom'odate itself to them?
A. Yes, sir; to those conditions.
Q. Now when you were navigating on the Kanawha River, there was only a six-foot project. Is that right?
A. Yes, sir; that is right.

Q. In the part of Kanawha River where you navigated, all the dams were wicket dams. Is that right?

A. I have navigated the length of the river as I stated before, with the Government, but all the dams below Marmet are wicket dams.

1409 Q. I am trying to get at your practical commercial experience before you went to the Government.

A. I see.

Q. During your experience before you went to the Government, there were only wicket dams in the part of the Kanawha where you navigated. Is that right?

A. Yes, sir.

Q. And those wickets were from time to time raised and lowered?

A. Yes, sir.

Q. And their raising and lowering from time to time created changes in pool height. Is that right?

A. The raising and lowering contributed to maintain the height.

Q. And while they were adjusting those, were there changes?

A. You have extra water coming down and you lower some of the wickets to maintain pool level above. At a certain stage this water coming in will give you extra water in the head of the next pool below, you will have more water there than you would have if the wickets had remained up.

Q. And from time to time during this period these wicket dams leaked, didn't they?

A. They always leaked.

Q. And oftentimes they leaked more water out than was coming in at the upper end of Pools, didn't they?

A. In dry weather they always did.

Q. And the result of that was that the pools frequently fell below project depths, didn't they?

A. Sometimes they fell below that depth, even when caulked.

Q. Because there was still more leakage going through the dam than water flowing to the dam. Is that right?

1410 A. That would cause it to fall, yes, sir; with less water coming in than going out, but those dams were caulked as tight as they could get them.

Q. Of course, but you had nothing to do with needling and caulking, did you?

A. No, sir.

Q. I suppose at times when the pools are below project depth, you sometimes had difficulties in navigation. Is that right?

A. Yes, sir.

Q. I believe you said you saw some work being done below Marmet dam in 1935. Is that right?

A. Yes, sir.

Q. What pool is below Marmet dam?

A. #6 pool.

Q. Maintained by #6 dam?

A. Yes, sir.

Q. Originally the #6 dam was designed to provide a 6 foot project, wasn't it?

A. Yes, sir.

Q. Isn't it a fact that the work which you saw done below Marmet Dam in 1935, was part of the construction work of Marmet?

A. No, sir.

Q. Were they, or not, cutting a channel to the lock on Marmet?

A. The work which I spoke of was removing silt between the guide walls at the lower approach to the lock. They did channel work with a dredge there, and widened and improved the channel both years.

Q. It was necessary, was it not, to do dredging and excavation in order to adapt upper end of old Lock #6 pool to the 9 foot project contemplated by the new dam?

1411 A. Yes. The entrance to this lock was built to accommodate a 9 foot stage and that was completed by the contractor and turned over to the Government. This work that we did, was done after it had been turned over to the Government.

Q. Is the depth now between Dam #6 and Marmet Dam, a six or nine foot controlling depth?

A. Yes, sir.

Q. Which is it?

A. Nine feet between Lock #6 and Marmet.

Q. And that is a changed condition from that which existed prior to this new improvement, is it not?

A. Yes, sir.

Q. You also made some statement about the question of anchoring barges. Does not good practice, on such a river as the Kanawha require that when a barge or tow is anchored it shall be sparred out?

A. It does, but whether that condition depends upon circumstances.

Q. Wouldn't you call it pretty rotten boating for any man to anchor his tow or barge along the river, like the Kanawha or Ohio, without sparring it out?

A. That is a reflection a little bit on my practice, but for your information I will say that this tow was sparred out at one end

and the other end was pulled in to the bank to enable the boat to get up to the barge, and the fleet was tied up to meet conditions as they were.

Q. That is, on the construction project?

A. Yes, sir.

Q. Would not good practice in the matter of commercial navigation on the Kanawha or Ohio, laying aside any con-
1412 struction project, dictate that if any tow boats or barges are anchored, they should be sparred up?

A. If they were going to stay there any length of time, or if you are going to tie up a night or in a fog, you do not carry spars and rigging and things like that, to push your tow out in the river, if you had landed for either an accident, a fog or any other reason.

Q. And if you do tie up under conditions you have assumed, you have tow boats there with a watchman on the tow boat?

A. Yes, sir.

Q. That is because you have had to make an unusual anchorage during a fog, isn't it?

A. Will you read that question.

(Question read to witness.)

A. If we had to make an unusual anchorage in the fog, we are liable to land any place.

Q. And that is the reason you have your tow boat with your men on it throughout the night, isn't it?

A. Yes, sir; you do, at other places, too, that is not the only place you have a tow boat, but your tow boat will be there with men on it, because the watchman is not a licensed man and he cannot handle the tow boat.

Q. Isn't it a fact that on any river you will spar out your boats when you anchor, when you are going to stay for any considerable length of time?

A. Yes, sir; but there are places in nearly all rivers where it is not necessary to spar out.

Q. You mean where there might be a vertical channel?

A. Yes, sir; but in most places you are supposed to spar out.

Q. Now, you named a lot of companies which you said had a number of tow boats and barges, or rather according to
1413 what you have stated, and I want to ask how high up on the Kanawha River do those companies operate?

A. The Hatfield-Campbell Company operate from Reed, West Virginia, which is about 3½ miles below Marmet. They operate from different points between Reed and the mouth of the river.

Q. I don't care about your going into details about that. Just give me the names.

A. The Raymond City Company, operate from Raymond City——

Q. Raymond City; where is that?

A. Raymond City is 25 miles below Charleston.

Q. Just proceed and tell me the different operations?

A. The Kanawha River Towing Company operate from Cedar Grove on out to Cincinnati.

Q. Can you locate that by some other better known land mark?

A. Cedar Grove is either nine or twelve miles above Marmet, I am not positive which. The Ohio River Dredging Company, operating from Harwood, which is about a mile below the mouth of Lout Creek. The Ohio River Coal Company, I am not positive whether they are operating from Longacre or from Cedar Grove. I think it is Longacre.

By Mr. WILLIAMS:

Q. Where is Longacre?

A. That is about a mile and a half below Lout Creek.

By Mr. JACKSON:

Q. All right, just go ahead.

A. And this man Shear, who is towing coal in the London and Marmet Pools. I think all of his coal is loaded at Longacre, but I am not positive about that.

Q. Is there any of them that operate above Marmet dam?

A. Yes, sir.

Q. Which ones?

A. The Kanawha River Towing Company and Ohio River Dredging Company.

1414 Q. Are they carriers, or not?

A. They are towing coal.

Q. And they tow coal from where to where?

A. The Kanawha River Towing Company is towing coal from Cedar Grove to say, Cincinnati. I was going to give you the name of the landing at the Lower end of Cincinnati, but I have forgotten it. The Ohio River Dredging Company is towing coal from Harwood to Ironton, Ohio. The Ohio River Coal Company is towing coal from whatever point it is they load up there, to Portsmouth, Ohio. In addition to that, these sand and gravel companies are towing gravel up the river to different points along the river.

Q. But they are always towing for construction, are they not?

A. Yes.

Q. Is that Government construction work?

A. Not always Government work; there is some private construction.

Q. There is very little private construction going on up the river, now, isn't there?

A. Very little, but once in a while they will have a few barges going up there.

Q. Can you tell me how much water is required for a lockage at dam No. 27, on the Ohio River?

A. No; I cannot tell you how much water is required but I can tell you how large the lock chamber is and the width of it.

Q. I think I can tell you that myself.

A. I never had that question come up before, and I don't know.

Q. Then you don't know what the lockage requirements daily are for Lock #27, do you?

1415 A. No, sir. That would depend on the amount of traffic and the amount of lockages they would have to make.

Q. You don't know what it is?

A. No, sir.

Q. Or what the traffic is?

A. No, sir.

Q. If you have enough water there to maintain the pool, that is, to provide for lockage and leakage, that is enough, whatever it is.

A. Yes, sir; and that is as far as we are interested.

Redirect examination by Mr. THOMPSON:

Q. Mr. Douglas, when you went into the Government service in 1929, did you do any towing for the Government on the Kanawha River?

A. Yes, sir.

Q. What kind of towing did you do?

A. We towed dredges, barges, scows, and equipment.

Q. Is towing for the Government different from towing for any other people or persons?

A. Not a bit different from towing for anybody else, in towing boats with the same draft.

Q. How often were you towing for the Government?

A. All the time.

Q. And you were going up the Kanawha River?

A. Part of the time. We were working up the Kanawha River when we were working with a dredge boat and we were working over the river more often than anybody else, because we were loading scows as far as we could load them.

1416 Q. What were those scows loaded with?

A. With sand and gravel.

Q. Did you tow any in the London Pool and the Marmet Pool?

A. I have not towed but very few scows in the London Pool since London has been built. I towed several there before London was built.

Q. Did you run any boats in the London and Marmet pools?

A. I have only made a few trips up there since the London dam has been built.

Q. When you ran your scows up what amount of water did they draw?

A. Six feet.

Q. And you moved those around in the upper end of the pools, did you?

A. Yes, sir.

Q. I believe you said you received some licenses from the Government as a Pilot and Master?

A. Yes, sir.

Q. Is there anything extraordinary about a person working for the Government receiving a license from the Government?

A. No, sir.

Q. Are his qualifications the same as those of a person who is not working for the Government?

A. They must be.

Q. Have you got your licenses here?

A. I have.

Q. Let me see them, please.

(Witness produces said licenses.)

By Mr. JACKSON. I do not see the relevancy of this evidence.

By the COURT:

Q. About three-fourths of the examination of each side has been entirely irrelevant, but as long as you are attacking the qualification of this witness, I think he has a right to go into it.

1417 A. I might state that I have to pass the same examination to obtain a license that anybody else does, and when I took my examination for a license, I was not in the employ of the Government, except for the Pilot's license on the Kanawha River.

By Mr. THOMPSON:

Q. I would like to have this license marked Government Exhibit 157 for identification.

(Said license is marked "Government Exhibit 157" for identification.)

(Said license is here introduced in evidence and is marked "Government Exhibit 157.")

By Mr. THOMPSON:

Q. I show you Government Exhibit 157 and will ask you if you know what that is?

A. Yes, sir, that is my license as Master and Pilot.

Q. Where?

A. On the Ohio and Kanawha Rivers.

By Mr. THOMPSON:

Q. Will you explain the difference between running a boat up the river and drawing a tow, or pulling a tow, if that is a proper expression to use, so far as getting through a narrow channel, such as you have said there was on the Kanawha?

A. You mean the difference between going up with a steamboat by itself and the act of towing a tow?

Q. Yes, sir.

A. There is a marked difference. You have much more power for the amount of weight that you have on the loose boat, and the boat would not be as heavy as your tow, it don't meet as much current, and is much easier to handle in these narrow, swift places, and you make more speed with a loose boat than a tow, with whatever amount of weight of tow, and whatever you add to that retards your speed just that much.

Q. Is there any swing back and forth out of line, due to towing?

1418 A. You mean the current sometimes runs from one side to the other?

Q. Does the tow get out of line with the boat?

A. No, sir.

Q. I mean the barges?

A. The boat is chained fast to the pole and they are maintained rigid with the tow.

Q. That is, when they are pushed, is it?

A. Yes, sir.

Q. Don't you pull them at all?

A. Not at all.

Q. Counsel asked you if it wasn't a fact that there were different changes in flow on these rivers. Do you or do you not take those into account?

A. Yes; I understood that to mean that the current would vary at different points on the river, some places due to narrow channel, and so forth. Even on pool waters there will be a noticeable difference in current.

Q. And as a navigator you know about these different currents, do you not?

A. You know they are there and where they are and where to meet them when you get to them.

Q. Are they or are they not caused by artificial movements of water down the river?

A. Not always.

Q. They are there permanently, are they?

A. They are there permanently, the natural flow of the pool water in some places.

Q. Do I understand you to say that, in answer to counsel on cross-examination, below the Marmet there were two types of work going on, one the clearing of this bar or dredging at
1419 a bar down below the dam some distance and the other work was work that was where you were dredging silt just below the dam itself; is that correct?

A. That is correct. The work consisted of widening of the existing channel below the approach to the lock. The removing of the silt was in the approach to the lock itself.

Q. And that was entirely separate work from the work——

A. Entirely separate. It was clear up inside of the walls that had been built of the locks. There were two long walls projecting beyond the locks at each end and this was between the two walls at the lower end of the lock.

Q. Counsel asked you if it wasn't a usual thing for silt to be deposited and I understood you to say "yes; at the upper ends of these pools."

A. It does on the upper end of pools and critical bars pile up naturally, slowly. They do in all the pools.

Q. Is there or is there not then a need, when they do build up with a silt in this way for all of the water you can possibly get from above in order to get over them?

By Mr. JACKSON:

Q. I object to that. He has already gone over it indirect.

By Mr. THOMPSON:

A. I did not ask that question before.

The COURT:

Q. The answer to it is so obvious to anybody, even to a court, that it is a mere waste of time to ask it.

A. Certainly.

By Mr. THOMPSON:

Q. You say you had some kind of experience so far as running aground is concerned or where you had to split your load in 1934 when you were working for the Government. Will you please state what that was?

A. This was when I was working for the Dravo Contracting Company.

By Mr. THOMPSON:

Q. And you were not working for the Government?

1420 A. Not working for the Government in 1934 and '35. I was working for the Dravo Contracting Company, towing sand and gravel from Goslin Bar which is just above Dam 23 on the Ohio River and that is about 42 miles above the mouth

of the Kanawha River to the dam that was building at Winfield. We came in with six barges en route to the dam and the Kanawha River was running out and the shore boss decided we would lose too much time to take these six barges to Winfield and instead of taking the barges on to Winfield, he tied all six of them up at Point Pleasant, and took a tow of empties back to the digger up Goslin Bar and left them lay there until the river run down to move them.

Q. Where is Goslin Bar?

A. That, as I say, is just above 23 which is about 42 miles above the mouth of the Kanawha River on the Ohio.

By Mr. THOMPSON:

Q. This license is very short and we would like, if you will permit, to read it into the record.

By Mr. WILLIAMS:

A. This is Government Exhibit 157. "File No. L-1938. Serial No. 12260. Issue No. 2, 4. License to Master of Steam and Motor Vessels.

"This is to certify that John R. Douglass has given satisfactory evidence to the undersigned United States Local Inspectors, Steamboat Inspection Service for the District of Point Pleasant, West Virginia, that he can safely be entrusted with the duties and responsibilities of Master of Steam and Motor Vessels of all gross tons upon the waters of Mississippi River and tributaries, also first class pilot from Lock No. 1, Monongahela River, to Cincinnati, Ohio, on the Ohio River, Alleghany River to
1421 Lock No. 1 and Great Kanawha River from Point Pleasant, West Virginia, to Marmet, West Virginia, and is hereby licensed to act as such master and pilot for the term of five years from this date.

"Given under our hands this 20th day of March, 1934."

(Signed) HARRY H. PULLEM,
U. S. Local Inspector of Hulls.
JOHN W. LOZIER,
U. S. Local Inspector of Boilers."

Recross examination by Mr. JACKSON:

Q. On your redirect you told about an incident where you brought six barges to a certain point on the Kanawha River in 1934?

By Mr. THOMPSON:

Q. He said Ohio.

A. I brought them down the Ohio to Point Pleasant. They were en route to Winfield, but the Kanawha River was running out and we left the tow there and took empties back up to the

digger because it would have taken too much time to take the tow up.

By Mr. JACKSON:

Q. The sand and gravel had been gotten up on the Ohio above the mouth of the Kanawha?

A. Yes.

Q. You brought it down to the mouth of the Kanawha?

A. Yes, supposed to deliver it to the dam that was being built at Winfield.

Q. When you say the river was running out, you mean there was a lot of water coming out?

1422 A. Yes.

Q. And it was because there was so much water coming out that you decided to leave your tow at Point Pleasant and take some empties back to the place where the sand and gravel was being obtained?

A. Yes.

Q. Isn't it a fact that 90 percent of the traffic on the Kanawha River is downstream, somewhere in that vicinity?

A. I couldn't tell you what percentage it is, but it way more downstream than upstream.

1423 CAPT. C. STONE

Direct examination by Mr. THOMPSON:

Q. Please give your name to the stenographer, Mr. Stone.

A. Capt. C. Stone.

Q. Where do you reside?

A. Point Pleasant, West Virginia.

Q. What is your occupation?

A. Operator and navigator of steamboats.

Q. Where were you born?

A. Point Pleasant, West Virginia.

Q. Are you employed by the Government?

A. No, sir.

Q. Are you a licensed pilot on the Ohio River?

A. Yes, sir.

Q. Are you a licensed pilot on the Kanawha River?

A. Yes, sir.

Q. When did you become a licensed pilot on the Ohio?

A. I became a licensed pilot in 1933.

1424 Q. Had you been running boats on that river before you became a licensed pilot?

A. I had been running a towboat in the general towboat business three years prior to that time.

Q. Where did you say your residence was?
A. Point Pleasant, West Virginia.
Q. Was that where you were born?
A. Yes, sir.
Q. What business was your father in when you were a boy?
A. My father was a ferry man at Point Pleasant.
Q. Where did the ferry cross?
A. From Point Pleasant to Henderson on the Kanawha River and from Point Pleasant to Kenova on the Ohio River.
Q. He ran two ferries, did he?
A. Yes, sir.
Q. Did you work with him on the ferries?
A. Yes, sir.
Q. What was the depth of the Ohio in the early days when you were a boy?
Mr. JACKSON. May we have our objection noted to the testimony about the Ohio River as not within the pleadings and have it show the exception?
The COURT. Yes.
A. The depths of the Ohio varied in seasons of the year.

By Mr. THOMPSON:

Q. At low water?
A. At low water it got down to as low as four feet.
Q. Did you ever wade it?
A. Oh, yes, many a time.

By the COURT:

Q. How old a man are you now?
A. Forty-three years old.

By Mr. THOMPSON:

Q. Where did you wade it?
1425 A. There at Point Pleasant to Kenova.
Q. How long have you been a licensed pilot on the Kanawha River?
A. Since 1933.
Q. Have you ever owned a boat of your own?
A. Yes, sir.
Q. Where did it run?
A. I operated the ferry from 1915 to 1931 by a steamboat.
Q. That is the ferry on the Kanawha?
A. Yes, sir. After the establishment of a bridge at Point Pleasant, I have been engaged since that time in the general contract towboat business.
Q. What are the duties of a pilot or master?

A. The duties of a pilot or the duties of the master is to have complete control of vessel. He examines the papers of the boat to see that they are in lawful duty and gives orders as to the operation and navigation of the vessel.

Q. And are his duties different from those of the pilot?

A. No, the duties of the pilot is to keep the boat in navigable waters and avoid bars and careful manipulations are under his supervision.

Q. You said you owned a boat, did you not?

A. Yes, sir.

Q. Did you have any tows, any scows?

A. Yes.

Q. Do you own them now?

A. Yes.

Q. Do you operate them now?

A. Yes.

Q. Where?

1426 A. At Point Pleasant on the Kanawha River. I operate out of Point Pleasant up the Kanawha and up and down the Ohio, unlimited district.

Q. What is the name of your boat?

A. Steamer "Tu-Endi-We."

Q. Do you own any other type of boat?

A. I own a gas boat of 100 horsepower named the "Eclipse."

Q. What is the capacity of that boat in the carrying of oil?

A. That is a towboat.

Q. I mean the barge?

A. One of the barges is what you call an oil barge. That carries 4,000 barrels of oil.

Q. Have you any coal barges?

A. Yes; I have three.

Q. And where do they operate?

A. They operate in connection with my towing on the Kanawha and Ohio.

Q. Please state to the court on what parts of the Ohio you have operated?

A. I operate from Freedom, Pennsylvania, to Ironton, Ohio.

Q. Where is Ironton, Ohio with regard to the confluence of the Kanawha and Ohio?

A. Ironton from the mouth of the Kanawha is 65 miles below the mouth of the Kanawha.

Q. Where do you operate your steamboat—from Longacre or Ironton?

A. And I have operated also from Point Pleasant as far as navigation on the Kanawha. I am unlimited.

Q. How far does navigation go, in your experience, on the Kanawha River?

1427 A. Since the construction of the London dam navigation can be had as far as Loop Creek.

Q. Have you ever seen any navigation beyond Loop Creek?

A. No.

Q. Did you ever see any other boats running up beyond Loop Creek?

A. No.

Q. I am not speaking of barges or steamboats. Did you ever see any boats going up above Loop Creek?

A. No; I never personally seen no boats go up there.

Q. I don't mean up Loop Creek but up the river?

A. No; not up the Kanawha.

Q. What is the capacity of your coal barges?

A. Three coal barges of one hundred tons each.

Q. What depth do you need in towing a full barge up the Kanawha River?

A. The Government allows us a depth of six feet in pool water.

Q. How much do you need?

A. Well, for safe navigation we should have at least seven.

Q. And as a result what do you do with your boats with regard to loading?

A. We load them to a draft of six feet in ordinary pool river.

Q. What does a loaded barge draw?

A. A loaded barge can be put down to nine feet.

Q. Where?

A. In the Ohio River.

Q. I mean the Kanawha?

A. You can load it to nine feet in the Kanawha.

1428 Q. What will happen?

A. You will stick it or you will wreck it.

Q. What do you usually load a barge?

A. Not over six feet.

Q. How much clearance do you have to have over critical bars when barges are loaded full?

A. At six feet draft we should have at least a foot clearance.

Q. Why is that?

A. So that we can manage the operation of our barges, so we can steer them.

Q. Do you have any difficulty steering the barges?

A. Oft times.

Q. Why is that?

A. On account of shallow water. The barges will pull out of their course. They will want to go to one side of the channel or the other. Oft times we have that condition.

Q. State to the court whether you ever had any difficulty in low water time in the Kanawha River operating your barges?

A. You are assuming pool stage?

Q. No, I am just assuming low water?

A. Yes, I have encountered trouble within recent years.

Q. What was that?

A. I had a six foot barge of gasoline to be delivered from Point Pleasant to Snow Hill, West Virginia, which is approximately six miles below the Marmet dam and that is, of course, in No. 6 pool. I managed to land the barge to the gasoline dock to where I was going to pump the gasoline up the hill into the tanks, and in order to do that I was compelled by the insurance company to get the steamboat 150 feet away from the barge before attempting to start pumping. That necessitated my taking the boat up the bank and tying it to the shore, then
1429 running a steam line over to the bank and then back to the gasoline barge in order to get to this pump. We got our piping all made secure and ready to pump at six o'clock in the evening in November of 1934. I don't know exactly the date of that, but about midnight the watchman woke me and told me the boat was sinking and I got up immediately and we had to disconnect the steam line and back the light steamboat off the rocks as the pool had went down and left me on from a two-foot difference.

Q. What caused this difference, if you know?

A. It was by the closing of some obstruction from the Marmet dam.

Q. When was the Marmet dam finished?

A. I think about in the year 1933 or '34. I will recall that fact. It was completed in '35.

Q. Then I understood you to say this was caused by shutting down the Marmet dam?

A. This was after the completion of the Marmet dam. To be exact about the date I won't make any attempt to give them.

Q. Was the Marmet dam operating at that time?

A. Yes, we were locking through the Marmet dam.

Q. State whether or not you have had any difficulties when you would tie up at night on the river?

A. Yes, I have met with difficulties in tying up. You see steamboats run, some of them, with a double crew and some with a single crew. Those operating under a single crew are restricted from running more than thirteen hours during the day under penalty of the law. Therefore we have got to go to the bank and tie up. Well, during the night time the changes in the river will either raise or fall. It has been more noticeable since construction of the Marmet dam than before but that is felt more in the

event that you are closer to the dam up at the upper e
1430 of the pool. You won't notice that wave so much at t
head of the dam but you will notice it at the head of t
pool where the water is the flattest and thinnest. I have h
occasion to have my boats stuck on the bank—my barges stu
on the bank, running a single crew, by that very change.

Q. Since the construction of the Marmet dam?

A. Yes, since the construction of the Marmet dam.

Q. Where did that occur?

A. It happened at Levi in 1935.

By the COURT:

Q. Levi is on the pool of the Marmet dam?

A. It is on the pool of No. 6 dam immediately below Marm
dam.

By Mr. THOMPSON:

Q. When you are operating a boat on the Kanawha and y
enter a lock, what is your custom with respect to finding out t
condition of the pool?

A. Well, when we are navigating the Kanawha River we g
the gages as we enter each and every lock. There is a gage ma
written on the Kanawha River. It is on boards and it starts
zero and comes up. We know by reading those gages whether
are going to have water enough to enter that lock or, in oth
words, to enter the locks above. They most generally alwa
give us a record to go by.

Q. Do you always look at those gage readings?

A. Yes, sir.

Q. Is there any other information which is furnished you?

A. Why, we can look at the bulletin board on the bank.

Q. Do you look at the bulletin board?

A. Yes, sir.

Q. What does the bulletin board tell you?

A. The bulletin board on the Kanawha Rives gives us the co
dition at Kanawha Falls and all pilots on the Kanawha Riv
reckon the Kanawha River pools by the Falls gage.

1431 Q. Do you follow that yourself, those bulletins, carefull
A. Yes, sir.

Q. Have you ever been misled by those bulletins?

A. No, sir.

Q. Do you ever get any information as to the conditions up t
river at Radford and Ivanhoe?

A. Yes, sir.

Q. Please tell the court about that?

A. At Point Pleasant at the local United States Governme
office they furnish the river interests a bulletin each morning

the condition of the Kanawha and Ohio Rivers as regards to the rainfall, the precipitation, and as to the gages at various points.

Q. Do they give you any information as to New River?

A. Oh, yes.

Q. As to conditions up there?

A. Yes, sir.

Q. Where.

A. From Radford, Ivanhoe and Hinton. Now, I may also relate that it has been within the last six months that the river interests has demanded that the Government give us a report from Ivanhoe and Radford. It is very essential to the river interests.

Q. Do they give it to you?

A. Yes, sir.

Q. What is the character of the information they give you?

A. They give us the precipitation.

Q. Where?

A. At Ivanhoe and Radford and also at Hinton and they give us the gages.

Q. Supposing that it shows a precipitation at Ivanhoe and Radford, how does that enter into your calculations with regard to navigation?

1432 A. With precipitation at Ivanhoe and Radford we expect a raise on the Kanawha River if the precipitation is in the neighborhood of an inch.

Q. And does that enter as a factor in your moving your commerce?

A. We expect to encounter a current.

Q. Have you ever encountered currents under such conditions?

A. We most generally get all of our currents from New River District. There are exceptions but we look for our currents from the New River district.

Q. What happens when you go against that current? What is your calculation? What do you do, if anything?

A. When we are coming upstream with a loaded cargo on our barges, the Kanawha River has not been entirely eradicated from chutes and dikes in the pools, even though the improved water stages the Government is trying to maintain for us. If we run up into these dikes and there is a raise from the head of the river, we are meeting with cross-currents and we are meeting with currents that impede our progress. It requires more power and the result is we have got to go to the bank and leave half of our tow and go with what we can go through these places with. The same thing will occur, you may illustrate, if you are going up a high grade on a railroad, they have got to have

more engines or have got to cut off less cars. There is no difference.

By the COURT:

Q. How high does the river get before you have to suspend navigation?

A. Well, most generally the water has to get up over the banks to where it would be disasterous to houses on the side of the river banks, flooded districts, when we most generally have to stop navigation and then also there as some crafts on the
1433 river that are built—the structures are too high to clear the bridges such as Charleston and Montgomery and Point Pleasant.

By Mr. THOMPSON:

Q. Did you ever have any trouble getting your gasoline boat up the river because of the London or Marmet dams, the operation of the power projects there?

A. No.

Q. Do you recall any time when the turbines at the Marmet dam have been cut off?

A. Well, that incident I spoke of in November. That was an incident that happened.

Q. When they cut off the turbines?

A. That was a condition in November of 1935, I believe, of a roller being shut down. The roller shut down the dam, but I wish to relate an incident that happened to me in this year, March of this year, due to the effect of a turbine being shut off. I disrecall the hour of the day.

Q. What time of the year was it?

A. This was in May of this year, 1936.

Q. The turbine in what dam, what project?

A. Supposed to have started in the London dam and then the Marmet dam had to take care of that wave that the London dam throwed on us and they opened up their turbines and resulted in what happened to me again.

Q. What did happen to you?

A. I went in the same port with a barge of gasoline drawing six feet. There wasn't enough water at that time to get in this port, into this dock. There was only five and one-half feet, so it necessitated that we had to lay our pipe line across the space of water and other light structures and craft in order to go ahead and pump out. I had to follow the same routine in getting my steamer above the gasoline barge again and it throwed us
1434 far out in the river—the contour of the banks on the Kanawha River at places are so flat and rocky that it held me still out in the river and we lost about four hours time, and

then the river was so low when we went in there at that time and the next morning the water was up considerably higher.

Q. Do you understand what is meant by the word "oscillations"?

A. Yes.

Q. What is your interpretation of the word "oscillations"?

A. My interpretation of the word "oscillations" is dividing and illustrating like the pendulum of a clock. It is a swing.

Q. Have you ever noticed any swings in the flow of the river below the Marmet dam since the Marmet project has been operating?

A. Yes. If you will allow me to use a different term—

Q. Use your own term.

A. I will say it was sort of a wave.

Q. Did that wave affect you in any way or affect navigation in any way that you know of?

A. This incident that I recall in May come from a wave. I investigated it to find out what caused it.

Q. In times of low water on the Kanawha, do you need all of the flow that is possible that comes from any source that enters that river?

A. Yes, sir.

Q. Have you ever observed the caulking and needling of the dams on that river?

A. Yes, sir.

Q. What would happen in low water time if they didn't caulk and needle these dams?

A. We would lose our navigable water.

Q. And what would happen then?

A. Commerce would be shut down.

1435 Q. What is the condition on the O' o so far as caulking and needling is concerned with re ct to navigation?

A. The same thing exists.

Q. Have you observed any sediment depositing in the upper ends of these pools on the Kanawha?

A. At Marmet dam I have observed it immediately below the dam, yes, sir.

Q. Have you gone up above the dam?

A. Yes, sir.

Q. Have you observed any deposit in the back end of that pool?

A. No, not at London, I haven't.

Q. I don't mean at London; I mean below London?

A. No, I haven't noticed it up at the upper end.

Q. Have you noticed any dredging going on at London and Marmet dams?

A. Personally I have never seen it but I know of it by records and bulletins.

Cross-examination by Mr. JACKSON:

Q. Capt. Stone, I think you said the first instance when you had difficulty in unloading your oil barge below Marmet in 1934 was caused by the closing of a roller gate at Marmet; is that right?

A. Yes.

By Mr. THOMPSON:

Q. I think he corrected that to '35.

A. You mentioned '35?

By Mr. JACKSON:

Q. No, '34.

A. It was in November '35.

Q. You also said that in 1935 you had some difficulty with an anchored barge or boat grounding at Levi, West Virginia; is that right?

1436 A. Yes.

Q. What time in '35 would you say that was?

A. That was in October 1935.

Q. Was that caused by shutting off a power wheel at Marmet?

A. No; that was caused by a roller in '35. In '36 was when the turbines give me trouble.

Q. That is both of these instances in '35 were caused by the closing of a roller at Marmet?

A. Yes.

Q. A roller gate?

A. Yes. There is a reason for that. The turbines wasn't completed before that time.

Q. You are right about that. Was your boat and barge sparred out at Levi, West Virginia?

A. No.

Q. You just pulled in by the bank and tied up?

A. Yes.

Q. I understood you to say that due to the insistence of rivermen the Government in the last six months has been furnishing rainfall or weather data at Point Pleasant dealing with rainfall up at Ivanhoe and on the headwaters of the New River—up in that territory?

A. Yes.

Q. Did you discover that they were furnishing that data within the last six months?

A. No; they have furnished us reports from that district years and years before that time, but it seems as though there was a

period there that they quit furnishing us. Why it was we don't know, and then the rivermen at Point Pleasant got busy and were trying to investigate why it was, but we got a river report again.

1437 Q. As I understand you, when you got a river report or weather report that indicated rainfall up the river, you anticipated an increase in current?

A. Yes.

Q. If you were going to go up the river?

A. Naturally.

Q. And that made it necessary to reduce your load?

A. Yes.

Q. You also stated that you had a further difficulty at this gasoline dock at Snow Hill. Give me the date of that?

A. That was in May of this year.

Q. Can you give me the day?

A. No; I can't. I could by looking on my log book on the boat, but I haven't it with me.

Q. Would you mind transmitting that information to Mr. Thompson or Mr. Williams?

A. When I go home?

Q. Yes.

A. Yes; I will be glad to.

Q. And do you remember now the time of day when you went there to anchor?

A. Yes. Most generally we got in there at noon.

Q. Did you get in at noon on that day or some other time?

A. That day.

Q. Is that the American Gas and Oil Dock?

A. Yes.

Q. And is that a dock that is on a sloping, shallow part of the pool?

A. It is out of the channel, yes. It is not in the channel. You understand no landings are in the channel. All docks are off to the side.

1438 Q. I understand that, but it is a shallow part of the pool where the bottom is both shallow and gradually sloping?

A. That is natural upon the Kanawha River.

Q. Some places, I assume are different from others in that respect?

A. That would be in the channel then.

Q. You mean all landings are shallow and on sloping ground?

A. Yes; unless companies have dredged them out.

Q. I understand from Mr. Douglass that some were not. That was the basis of my question. Have you ever seen what you call

oscillations in Pool No. 6 before the construction of the Marmet dam?

A. No.

Q. You never saw any before that?

A. No.

Q. Did you ever see any oscillations, as you call them, at any pool other than the one to which you have referred?

A. No; but now may I interrupt you a second and say that I have noticed a sudden raise in the river due to rainfalls and cloudbursts on the head of the Kanawha. I won't mislead you to believe that I haven't registered or noticed the rise and fall in the Kanawha River but that come from natural conditions.

Q. Those sudden rises can come from comparatively small creeks along the Kanawha, can't they?

A. Yes.

Q. That is something natural that may happen any time?

A. Especially on the Kanawha River because the Kanawha River will register a drop of water so quick.

1439 Redirect examination by Mr. THOMPSON:

Q. What is the most essential factor for a navigator to know on the Kanawha River in moving commerce?

A. The most essential fact to move commerce on the Kanawha River at the present day is to know the gages, to know the river gages.

Q. What kind of a river?

A. Yes, we must have a full pool to move six foot commerce on the Kanawha River. That is very essential.

Recross examination by Mr. JACKSON:

Q. You did say that when the depth was shallow it made steering somewhat more difficult?

A. Yes.

Q. Does a little rise in the water help that?

A. No; a rise in the water really makes it worse.

Q. That is the difficulty in steering that comes from low water is made worse by an addition to that?

A. Yes; it depends on the little rise. You speak of a little rise—a big rise we are all right, but you take a little rise on top of shallow water, it doubles that much more interfering.

Q. Could you give me some rough definition of a little rise and a big rise?

A. You take a rise of 6/10 of a foot in Elk chute, if you know where Elk chute is, and you will be bothered considerably. Elk chute is considered one of the worst chutes we have on Kanawha River and by the building of the Winfield dam, it is not going

to help Elk chute a great deal because it is too close to behind Marmet dam.

1440 Q. It is between Marmet and Winfield?

A. Between Winfield and Marmet dam.

Q. Have you completed your estimation of what you mean by a small rise and large rise?

A. Yes; I think I have.

1510 H. G. GERDES, recalled on behalf of the United States.

Direct examination by Mr. THOMPSON:

Q. Mr. Gerdes, are you acquainted with the pool behind the London Dam?

A. I am.

Q. In what way have you become acquainted with it?

A. On July 22nd I made a boat trip through that pool.

Q. What kind of a boat did you use?

A. I took the Engineer Department Survey Boat, equipped with an outboard motor, smaller than the one I used before.

Q. Where did you start from?

A. Below the London Dam.

Q. What was the length of this boat?

A. 16 feet.

Q. What kind of an outboard motor did you have?

A. It was a Johnson Sea Horse—24 horse power motor.

Q. And how far up the pool behind the London Dam did you go?

A. I traveled up the entire length of the pool, passed a shoal near the head, near Boonesboro and proceeded then upstream to a point immediately beneath the Kanawha Falls Dam.

Q. Did you get out of the boat?

A. We had to get out and pull the boat through part of this shoal near Boonesboro because the water was muddy, and the propeller struck the shoal spots a number of times and after trying to feel our way along, we decided to pull the boat through a part of that shoal.

Q. How far did you pull the boat through that shoal?

A. A distance of somewhere between one-eighth and a quarter of a mile.

Q. What was the depth that the motor was drawing?

A. Approximately three feet.

Q. And after you got over that shoal, you got as far as a point immediately beneath the Kanawha Falls Dam?

A. Yes, sir.

1511 Q. Have you any acquaintance behind the dam at Kanawha Falls?

A. Yes, sir.

Q. Please state what that acquaintance is?

A. On the same day I launched this boat in the so-called Glen Ferris pool immediately above the dam and travelled upstream through its entire length.

Q. How far upstream did you go?

A. Approximately three miles.

Q. And where did that take you to?

A. That took us up through a minor rapid below the Hawk's Next Power House, to a point between a quarter and half a mile above Hawk's Nest Power House.

Q. Have you any acquaintance with the Hawks Nest Pool?

A. I have.

Q. Please state how?

A. I took this same boat, launched it, in the Hawks Nest Pool, at Hawks Nest, travelled up the river approximately two miles to the head of the pool, then turned and ran down through the length of the pool to the Hawks Nest Dam and then back to the point of beginning. The total length of the Hawks Nest pool that was traversed was approximately three miles.

Q. Do you know whether the gates of the Hawks Nest Dam were up at the time?

A. There were no gates in place at the time, the water level was at the fixed crest of the dam.

Q. How high will these gates raise the water level when in place?

A. Approximately 20 feet.

Q. And how far upstream do you estimate that that will make the pool?

A. That should be good for at least half a mile, or possibly a mile of pool.

Q. What is the condition of the channel and stream flow in what is termed the gorge, where the Hawks Nest Dam is located?

A. You mean below the dam?

1512 Q. Above the dam and below?

A. The gorge, so-called, below the Hawks Nest Dam at the time I visited it, was practically dry, the entire flow of the river being diverted through the power plant tunnel to the power house. Above the dam the valley floor is occupied by the pool which forms a really excellent navigable lake some three miles long.

Q. Are you familiar with the report of Chief Justice Marshall, on his navigation of New River, from Hinton to Kanawha Falls?

A. No, sir; I am not.

Q. Are you familiar with the Moore—and Briggs report?

A. Yes, sir; I am.

Q. Did you have any difficulties in navigating that pool?
A. I did not.

By The Court:

Q. With reference to the Hawks Nest Dam, does not that water return to New River somewhere?
A. It does, at a point, I believe about four miles below.
Q. The portion of the river that you referred to as being comparatively dry was between the Hawks Nest Dam and the Power House?
A. Yes, sir; that is correct, that is the section of the river that was being bypassed.
Q. I hand you, marked for identification, what purports to be an album of photographs marked Government Exhibit 183, and will ask you if you know what that is.
A. This is an album which contains——
Q. What is it?
A. This is an album containing 20 photographs, being views of pools, shoals, rapids and dams on Kanawha River and New River, between London Locks, West Virginia, and Hawks Nest, West Virginia, taken July 22, 1936.
1513 Q. Were you present when these photographs were taken?
A. I was.
By Mr. Thompson. I now desire to offer in evidence Government Exhibit 183, which has been marked for identification Government Exhibit 183.
By Mr. Jackson. We have no objection to it except to its relevancy.
(Said exhibit is here filed, marked Government Exhibit 183.)

By Mr. Thompson:

Q. I call your attention to the photographs and ask you to explain them as you go along.
The first one, what is that?
A. The first one is a photograph of the survey boat which I employed leaving London Lock, and bound upstream.
Q. Now what is the second photograph?
A. The second photograph is a view looking upstream of the shoal in the river near Boonesboro.
Q. That is in West Virginia?
A. Yes, sir.
Q. Now turn to the second page. What is the photograph No. 3 there?
A. Photograph No. 3 shows the pool below Kanawha Falls Dam, beneath the Toll Bridge at Boonesboro, just above the shoal shown in the preceding photograph.

Q. Now what is Photograph No. 4?

A. The fourth photograph shows the upper end of pool below Kanawha Falls, looking upstream, at the Glen Ferris Dam.

Q. And that is known also as Kanawha Falls?

A. That Glen Ferris Dam is sometimes known as the Kanawha Falls dam. It is a low structure on the crest of the falls.

Q. Now what is photograph No. 5?

A. Photograph No. 5 is another view of the pool below Kanawha Falls dam, looking towards shore, at the Electro-Metallurgical Company, Kanawha Falls Power Plant.

Q. What is Photograph No. 6?

A. Photograph No. 6, shows the upper end of this pool immediately beneath the Kanawha Falls Dam.

Q. What did you do when you arrived at that point?

A. We travelled a short distance downstream then took the boat out, brought it around and launched it again in the pool above the dam.

1514 Q. In other words, you portaged it there?

A. Yes, sir.

Q. Now turn to page No. 3, what is Photograph No. 7?

A. Photograph No. 7 is a view of the spot just previously described looking upstream, and showing Kanawha Falls Dam.

Q. Now describe Photograph No. 8?

A. Photograph No. 8 shows a boat in the pool above Kanawha Falls Dam. The dam itself may be seen in the middle portion of the picture.

Q. Now turn to the next page and describe what Photograph No. 9 is?

A. Photograph No. 9 shows a boat near the head of Kanawha Falls pool, the boat is approximately in the middle of the photograph, entering the rapids below the Hawks Nest power plant.

Q. Now what is Photograph No. 10?

A. Photograph No. 10 is a view just a few feet further upstream showing the boat in the same rapids, with Hawks Nest Power Plant shown behind it.

Q. The Hawks Nest project turns the water in at the dam through a tunnel running approximately three miles long, doesn't it?

A. That is correct.

Q. And it cuts the water off from the riverbed for a distance of how many miles?

A. Between four and five miles.

Q. You have already described Photographs 9 and 10, have you not?

A. Yes, sir.

ow turn to the next page and state what Photograph No.

notograph No. 11 shows the boat traveling upstream in
ids below the Hawks Nest Power Plant.
that the tail race going to the Hawks Nest Power Plant?
at is immediately below the tail race, and might be con-
a part of the tail race of the Hawks Nest Power
lant.
Q. Now explain Photograph No. 12.
A. Photograph No. 12 shows the boat emerging at the
the same rapids.
id you have any difficulty in that rapids?
one whatever.
ow turn to the next page and explain what Photograph
s.
notograph No. 13 shows the boat traveling in the pool
e Hawks Nest Power Plant.
ow explain what Photograph No. 14 is.
notograph No. 14 is a view taken from the corner of the
Nest Power House, looking upstream, showing the survey
raversing the same pool above the Hawks Nest Power

ou are now in the pool or up in what is known as the

es, sir.
nd above the Hawks Nest Dam itself?
ot above the dam, but immediately above the power plant.
at is right. Now turn to Page on which photograph No.
d explain that.
. In regard to photograph No. 14, that shows a view of
r?
s, sir.
fore the water utilized by the power plant has been
l. Is that correct?
shows a portion of the river between the dam and the
lant, immediately upstream from the power plant, and
er is visible in the photograph is slack water in the tail
other words, while the picture is looking upstream, there
w downstream because that was simply slack water from
all of the power plant.

y Mr. JACKSON:

ove the Hawks Nest Pool?
HOMPSON. No; below the Hawks Nest Pool. I said above
corrected me. The title says part of the pool at the
Nest Power Plant.

1516 Mr. JACKSON. Are you talking about photograph No. 13 or No. 14?

A. No. 14.

Q. The legend below says, Pool Above Hawks Nest Power Plant?

A. That is correct, it is only a few feet above, upstream from it.

Q. Is it a part of the pool behind the dam?

Mr. THOMPSON. It is not a part of the pool that is behind the dam, it is the back water from the tail race to the Power Plant, as I understand it. Is that correct, Mr. Gerdes?

A. Yes, sir. Perhaps I had better explain that. Photograph No. 13, in it you will observe the power house, and photograph 14 was taken from the right hand corner of the Power House looking upstream.

Q. Looking in the same direction as the view shown in Photograph No. 13?

A. That is correct, in other words, photograph No. 14 shows part of the same pool as is shown in Photograph No. 13.

Q. Now, turn to the next page and explain Photograph No. 15?

A. Photograph No. 15 shows the greater part of the Hawks Nest Dam Pool. This view was taken from the Hawks Nest itself looking upstream.

Q. You mean from the dam itself?

A. No; from the lookout point above the dam, known as Hawks Nest.

Q. Now explain Photograph No. 16?

A. No. 16 shows a part or portion of the Hawks Nest Dam pool looking upstream.

By the COURT:

Q. Photograph No. 15 is looking upstream also, is it not?

A. Yes, sir.

Q. Is that a highway or railroad bridge?

A. That is a railroad bridge. It connects the branch line of the C. & O. on the bank in the left of the picture with the main line, which is on the right of the photograph.

By Mr. THOMPSON:

Q. And is Photograph No. 15, a picture of what is known as the Gorge?

A. Yes, sir.

1517 Q. Now turn to the next page and explain what Photograph No. 17 is?

A. Photograph No. 17 is a view at the upper end of Hawks Nest Dam Pool.

Q. And that is still in the gorge, is it?

A. Yes, sir.

Q. Now what is Photograph No. 18?

A. Photograph No. 18 is a view from the same point, near the upper end of Hawks Nest Dam Pool looking downstream.

Q. Now turn to the next page and explain what Photograph No. 19 is?

A. Photograph No. 19 is a photograph taken from the boat in the Hawks Nest Pool at the dam, looking downstream towards the dam.

Q. Now please explain what photograph No. 20 is?

A. No. 20 is a photograph taken the same day looking at the Hawks Nest Dam from the downstream side.

Q. Now turn to the next page?

A. That is the last photograph.

By the COURT:

Q. What part of the project do you call that tunnel which carries the water to the power plant?

A. In what sense?

Q. You would not call it the fore-bay, would you? You know that term is sometimes used, don't you?

A. Yes, sir; the word fore-bay is applied to the place where water is impounded for delivery into the pipe. Ordinarily in hydroelectric engineering that tunnel section is simply called a tunnel.

The Hawks Nest Power Plant has a surge tank at the head of the penstock, both located on a hillside, several hundred feet back of the plant. That surge tank is a steel tank which takes the place of what on other projects is a pond within
1518 earthen or a concrete embankment known as a fore-bay.

In the Federal Power Commission classification of accounts, for instance, the tunnel would be treated as a tunnel, as one of the intake works.

By Mr. THOMPSON:

Q. When you were last on the witness stand, Mr. Jackson asked you for the river flow at Bull Falls when you ran your boat up the falls. Have you that data now?

A. I have.

Q. Will you please present it to the Court?

A. I have here a blueprint of the automatic recording gauge chart giving the hydrograph of the New River near Hinton for period July 21 to July 30th. A boat trip over Bull Falls was made on July 27 at 7 p. m. I find that at that time the power waves coming down the river from Buck and Byllesby were

traveling through that section of the river at a speed of 2.6 miles per hour, which means that the same point on the wave would pass by this gauge, which is 7.7 miles downstream, three hours later.

Following that the stream flow at this gauge at 10 p. m., three hours later, for July 27th, was 2,120 cubic feet per second, which is somewhat less than it had been when I was on the river previously.

By Mr. JACKSON:

Q. Was that 2307?

A. It was 2120.

By Mr. THOMPSON:

Q. I hand you the chart——

A. This is a copy of a chart furnished Colonel Scheidenhelm. I don't think it is necessary to offer it here unless you want it.

Mr. JACKSON. I want you to produce it.

By Mr. THOMPSON:

Q. I show you, marked for identification Government's Exhibit No. 184, with statement in the lower corner, right, as follows: "State Line in vicinity of Round Bottom Branch." Do you know what that exhibit represents?

A. I do.

Q. What is that exhibit?

A. It consists of an aerial mosaic of three photographs
1519 placed in adjacent positions to form a map of New River and its banks in the vicinity of Round Bottom Branch.

Q. Who prepared that, do you know?

A. This was prepared in the United States Engineers' office in Hinton, West Virginia.

Q. Can you, of your own knowledge, identify the locations on that map?

A. I can and I have.

Q. State whether or not that map was prepared under your direction?

A. It was prepared under my direction; yes.

Q. I offer Government's Exhibit No. 184 in evidence.

By Mr. JACKSON. For what purpose is it offered in evidence, in the first place?

By Mr. THOMPSON. To show the location of Round Bottom, Round Bottom Creek and the State line dividing the State of Virginia and the State of West Virginia.

By Mr. JACKSON. We object to the competency of the Exhibit. There is no proof that this witness is competent to lay out State lines between Virginia and West Virginia. He did not make it.

There is no magic in someone saying that they directed that something be done. I could do that myself.

By Mr. THOMPSON. I asked if he could identify the locations on the map and he said that he could, and he also replied that he had made a comparison of the map.

Q. What kind of comparison did you make?

A. I compared—as to the photographs, I compared them with the river and its banks, as I know them from having traversed them and the data on the exhibit was placed on there at my direction and from material prepared by myself.

Q. What is the stream that is in that picture?

A. New River.

Q. And which way is it flowing, from the right, let's say [indicating]?

A. It is flowing towards the right.

Q. It is flowing towards the right?

A. Yes, sir.

Q. Who put the red lines on there [indicating]?

A. Draughtsmen—at my request.

Q. Did you check those red lines?

A. Yes, sir.

Q. What do the red lines indicate?

A. The red lines indicate the position of the Virginia and the West Virginia state line.

1520 Q. And where did you get the information as to the position of the Virginia and the West Virginia state line?

A. From several sources.

Q. What were they?

A. (Witness produces papers.) I have here an abstract of a survey, establishing the dividing line between Giles county, Virginia, and Mercer County, West Virginia, pursuant to an Act of the General Assembly of Virginia, passed March 5th, 1841. The description of this—a portion of this survey, is as follows:

"Beginning at said Falls"—meaning Wyley's Falls—"and running South 28½ degrees, West 28 poles," etc.

That correctly describes the straight red line in the left portion of the Exhibit. I may add that this was an Act of the General Assembly of Virginia, separating Giles and Mercer Counties. Later on Mercer County went with West Virginia.

By Mr. ABBOT:

Q. That survey is recorded in Giles County, Virginia, is it not?

A. (Witness examines papers.) Yes, sir; it is recorded in the County Court of Giles County, Virginia, June 6th, 1848.

By Mr. THOMPSON:

Q. You may continue.

A. I have here some excerpts from an Act establishing the county of Summers out of parts of the counties of Mercer, Monroe, Greenbrier, and Fayette.

By Mr. ABBOT. We object to any Act of the Legislature or any act or action taken under such acts, inasmuch as it is after the fact—Giles County and its lines were established long before Summers County was. That is an Act of the West Virginia Legislature, and it would have no effect on the lines between Virginia and West Virginia.

By the WITNESS. It may appear, if I may continue, that it will have some effect.

By the COURT. Does it indicate where the line was? Is there any denial of the accuracy of it?

By Mr. ABBOT. It is entirely inaccurate, we think.

By Mr. JACKSON. If you compare the map shown in Colonel Allstaeder's report, which the Government offered, you will see that it is entirely different from that shown on this map.

By the COURT. What height was this picture taken from?

A. From a height of approximately ten thousand (10,000) feet.

By Mr. THOMPSON:

Q. I hand you, marked for identification, United States Geological Survey Quadrangle Sheet, marked for identification Government's exhibit No. 185. What is that?

A. It is United States Geological Survey, quadrangle sheet of Peterstown.

Q. Does it show the State line between the State of Virginia and the state of West Virginia?

A. It does, yes, sir.

Q. Have you compared that with the line—the red line that you have drawn on this Government's Exhibit No. 184 for identification?

1521 A. I have.

Q. State whether or not the red line on Government's Exhibit No. 184, for identification, is in line with the dividing line of the State, as shown by the Geological Survey map?

A. The United States Geological Survey map is drawn on a scale of one inch to a mile and naturally does not show as great detail as the map offered as Government's exhibit for identification No. 184. However, as to the degree of accuracy with which the line can be read on the quadrangle sheet, the two are in correspondence.

By Mr. ABBOT. Do I understand, Mr. Thompson, that you are offering that sheet in evidence?

By Mr. THOMPSON. Yes, sir. I offer Government's exhibit marked for identification No. 185 at this time.

By Mr. ABBOT. We object to it, so far as the State line is shown on it, because the United States Geographical Survey have neither the power nor authority to establish State lines, and it is not the best evidance of the State line.

By Mr. THOMPSON. We are showing the sources from which he got the information and plotted the line.

By Mr. ABBOT. We question the sources.

By Mr. THOMPSON. Q. Have you any other sources from which you gathered data upon which you based your line?

By Mr. ABBOT. Did you rule on our objection, your Honor?

By the COURT. I will allow it to go in, with his explanation of how he came to make it that way.

By Mr. JACKSON. The photograph is not offered in evidence as yet.

By Mr. THOMPSON. I have it in for identification—we offered the United States Geological Survey sheet and they objected to it.

By the COURT. I will admit it.

By Mr. ABBOT. We EXCEPT to the ruling of the Court, for reasons stated.

By Mr. THOMPSON:

Q. Have you any other sources from which you gathered data with respect to this State line?

A. A little back, I was reading excerpts from which they established the County of Summers, and it was objected to. May I proceed with that?

By Mr. THOMPSON. (Addressing the Court.) Counsel on the other side objected to his reading excerpts and Your Honor did not rule on it.

By the COURT. Go ahead.

Mr. ABBOT. We EXCEPT to the ruling of the Court for reasons stated.

By the WITNESS. These [indicating papers] are excerpts from an Act establishing the County of Summers, out of parts of Mercer County, Monroe County, Greenbrier County and Fayette County——

By Mr. JACKSON:

Q. An Act of what authority?

A. This is an Act of the Legislature of West Virginia [indicating].

By Mr. THOMPSON:

Q. What is the date of it?

A. February 28th, 1871 (reading): "Be it enacted by the legislature of West Virginia: 1. So much of the Counties of Monroe,

Mercer, Greenbrier, and Fayette as is included within the following boundary lines to wit: Beginning at the mouth of Roundbottom Branch on New River in Monroe County; thence crossing said river and running north 47½ degrees west 5,430 poles through the county of Mercer, etc." I am indicating from the Exhibit No. 184. That description I have read refers to the black circle on the lower side of New River at the point where the red line indicating the State boundary crosses it. I will continue: "Thence (reading) crossing said river and running North 47½ degrees, West, 5400 odd feet through the county of Mercer." That description that I have read establishes that part of the red line indicating the State line across the river. I also want to call attention to the fact that in that description that
1522 I read, Round Botton Branch is clearly named as the stream entering the river, from the East.

Q. Where is that located on this photograph [indicating]?

A. That is on the lower portion of the photograph with reference to New River. I make this distinction because the stream entering New River from the upper portion of the photograph on the opposite bank, is also known as Round Bottom Branch.

Q. The Round Bottom Branch that you refer to is on the lower side of the river?

A. Yes, sir.

Q. And it follows what?

A. It follows the State line on that side of the river.

Q. Is it the State line?

A. That I cannot say.

Q. Continue. Look at the photograph again and indicate how Round Bottom Branch and the lower side of the river is indicated in the picture, and state it to the Court?

A. Round Bottom Branch entering the river at the right bank, which is the lower part of the photograph, appears in the photograph as following the red line, which is shown as the State line.

Q. Continue.

A. I have here a plat and description of a parcel of real estate, designated as Parcel No. 88, which was purchased by the Appalachian Electric Power Company for the Bluestone development, from Clarence E. Morgan, and which shows on the deed the State boundary between Virginia and West Virginia.

By Mr. JACKSON. We object to what it shows unless it is in evidence and proved to be competent evidence to be received.

By Mr. THOMPSON. I thought you wanted the sources?

By Mr. JACKSON. We do not want it from incompetent sources however,

By Mr. THOMPSON:

Q. I hand you two photostatic sheets fastened together, and marked for identification as Government's Exhibit No. 186, and ask you do you know what that is?

A. I do.

Q. What is it?

A. That is a map and a deed description of a parcel of land on New River on the right bank adjacent to the boundary line between the State of Virginia and of West Virginia. This
1523 parcel, referring to Exhibit——

Q. Which exhibit?

A. Exhibit No. 184—is located to the left of and adjacent to the black circle on the East Bank of the river at the point where the State line crosses it—the State line shown crossing the river.

By Mr. JACKSON. You are talking about this exhibit [indicating]?

A. No, sir; I am referring to Exhibit 186.

By Mr. JACKSON. We object to this referring to what is shown on the Exhibit until it is offered in evidence and the Court says it is competent evidence.

By the COURT. What is Exhibit No. 186?

A. Photostatic sheets of a piece of real estate and deed description in the deeds. It is a piece of real estate acquired by the Appalachian Electric Power Company for the Bluestone development at the time they thought they would build it.

By Mr. ABBOT. We still think so.

By Mr. JACKSON. Is it offered in evidence; if so, for what purpose?

By Mr. THOMPSON. We offered it in evidence for the purpose of giving the sources of information which we show in the plotted lines.

By the WITNESS. The State lines on Exhibit 184, for identification——

By Mr. JACKSON. I don't know of any process by which incompetent evidence can be introduced in a case by showing the sources of an exhibit that they are trying to get in evidence.

By Mr. THOMPSON. We differ with you that it is incompetent evidence.

By the COURT. What is the objection?

By Mr. JACKSON. The only competency of a map prepared in the manner of the one under inquiry would have, would be on the theory of admission. The Appalachian Electric Power Company, no more than the Geological Survey, is charged with the duty or power of fixing or determining boundaries between Virginia and West Virginia.

By Mr. THOMPSON. It may be an admission on your part.

By Mr. JACKSON. I am coming to that. The Appalachian Electric Company could not, for its own purposes, determine the location of a State line. That may be something put on there casually, just as lots of information is put on a map in the purchase of lands, and to say that it is an admission that is admissible as evidence in a judicial proceeding, would be going far beyond any possible rule.

By the COURT. Where there seems to be no available way to prove where a State line is, it must be proved in a variety of ways.

By Mr. JACKSON. The witness does not know how the map was prepared. It may have been done by a draftsman who was merely filling out the edges of a map. Now, can they offer this kind of material as evidence and throw upon us the burden of ferreting out from what sources it came.

By the COURT. I do not know that I catch your objection. But it is not an infrequent thing, in this country, and in a great many sections, to get into a dispute as to where a State or County line is, and if there is no ready and available record of it, they introduce old deeds showing State lines, and introduce old people to come in and say 'this was in my day considered to be the State line—Jim Jones lived there and paid taxes and voted in West Virginia', etc. All the data that you can get is produced to show the State line. That is the only way frequently to prove State and county lines.

By Mr. JACKSON. I just want to make our position clear: I do not think that State lines can be established by reference to casual and fugitive reports of private individuals or by reference to ancient deeds or to other evidence not infrequently wrong, when there appears that there are sources that are determinative and would establish and define what the State line is. They would have to show that no such Statutes existed, before laying the ground for such evidence, and, where it appears by their own evidence, as it does, by reference to Virginia Statute of 1841, that there is better evidence, that evidence, I think, would be controlling over any private paper or map.

By the COURT. They are not trying to establish a State line, but trying to show where it was recognized to be established. If you have anything to deny that, all you have to do is produce it.

By Mr. JACKSON. I only state that the witness referred to the Act of 1841, which defined the line.

By the COURT. The situation is this—Virginia and West Virginia parted company under terms that were not amicable and probably each of them questioned the right of the other to pass on the line between them. There is, I know, on the North part of

the Shenandoah, there is a considerable portion of land there in neither State at this time. Both states claim it and both states have it listed for taxation.

By the WITNESS, May I make a statement?

By the COURT. (Continuing.) This is because the States have never agreed on where the line was.

The objection is overruled, and the Defendant, by counsel, EXCEPTS to the ruling of the Court for reasons stated.

By Mr. THOMPSON:

Q. In connection with exhibit No. 186——

A. May I say that, faced with the difficulty you have described, I have already gone over the procedure you mentioned, in finding parcels of land situated adjacent to what I thought was the State line, where taxes were paid and deeds are of record and taxes are paid over a number of years, as giving common consent as to what was the State line and this is a border parcel——

By Mr. ABBOT. We object to that and move to strike the answer as hearsay evidence.

The objection is overruled and the defendant excepts to the ruling of the Court.

By Mr. THOMPSON:

Q. Where is this parcel of land, referred to in Government's Exhibit 186, located, so far as the line of Virginia and West Virginia is concerned?

A. It is located on the right bank of New River, in Virginia, adjacent to the West Virginia State line, which there crosses the river from West to East, traveling downward up the Creek known as Round Bottom Branch, in Exhibit 184.—Exhibit 186 which is a plat and description, shows that this parcel of land was purchased by the Franklin Real Estate Company from Clarence E. Morgan, April. 1931, and the description of the deed states, among other things "All that certain tract of land on the right bank of New River, in Giles County, Virginia, in Pearisburg District, Giles County, Virginia."

Q. Have you any other data upon which you drew your conclusions as to where the State line was?

A. I have a similar map and tract of land and deed description on the left bank of the New River, adjacent to the river.

Q. What do you mean the "left bank?"

A. The left bank is the left bank facing down stream—the upper side of this Exhibit 184.

1524 Q. The upper side of the stream facing down stream?

A. The left bank facing down stream, is the upper bank in Exhibit 184, as the picture is looked at. This parcel of land was purchased by the Franklin Real Estate Company, subsidiary of the Appalachian Electric Power Company.

By Mr. ABBOT. If that is offered in evidence, we make the same objections to it and I assume the same ruling and we except.

By the COURT. Yes, sir.

The defendant excepts to the ruling of the Court, for reasons stated.

A. It was purchased from Annie Dickinson, March, 1930, and the deed says: "All that certain tract of land on the West side of New River, in East River District, Mercer County, West Virginia." The map of the tract shows the boundary line between Virginia and West Virginia, shown in Exhibit 184, meeting New River at Wyley's Falls, and down stream along the left bank of the River between East River District of Mercer County, West Virginia, and Pearisburg District, Giles county, in the State of Virginia.

By Mr. THOMPSON. I don't know if we have offered this marked for identification [indicating]? Have we introduced it?

A. No, sir.

Q. You testified as to the two photostatic sheets, marked for identification as Government Exhibit 187?

A. Yes, sir.

By Mr. THOMPSON. I offer as Government's Exhibit No. 187, in evidence.

Counsel for the defendant makes the same objection heretofore made, which is overruled, and defendant excepts for reasons stated.

(Exhibit 188, being Key Property Map of A. E. P. Co. for Bluestone Development, was offered in evidence and Defendant objected thereto.)

Q. You may proceed.

A. This map locates and identifies the parcels of land——

Mr. ABBOT. If that is let in, your Honor, we make the same objection and except for the reasons we gave.

A. (Continuing.) This map locates and identifies the parcels of land just previously described in the vicinity of Round Bottom, being the Clarence E. Morgan tract, noted as No. 88 on the exhibit, and the Annie Dickinson tract—the number is indistinguishable here, also introduced as an exhibit. It also shows the State line between West Virginia and Virginia touching New River at Wylie's Falls, thence downstream along the left bank to Round Bottom, thence crossing the river in an easterly direction and going back up Round Bottom Branch.

By Mr. THOMPSON:

Q. That Annie Dickinson tract was Government Exhibit 187?

A. Yes, sir; and the parcel number which I was trying to distinguish was no. 192.

By the COURT:

Q. You say that exhibit shows the State line. How does it show it—by you or someone else having marked it on there?

A. No, sir; this is the State line as it was placed on this drawing at the time it was prepared.

By Mr. THOMPSON:

Q. By whom?

1525 A. By the employee of the Appalachian Electric Power Company, the real estate department, who made up this map and both from that fact and from everything which I have been able to locate while trying to identify the State line, it shows the State line as it is locally accepted.

Mr. ABBOT. We object to the local acceptation of the state line as having any bearing whatever on it. He is not competent to tell about it. It is hearsay, as far as he is concerned.

The COURT. I over-rule the objection.

Mr. ABBOT. We except.

A. I may also say that inquiry was made from the County Clerks of the Counties of Giles and Mercer and this state line corresponds with their best knowledge.

Mr. THOMPSON. That is hearsay. I withdraw that.

Mr. JACKSON. We move to strike it out as hearsay.

By Mr. THOMPSON:

Q. Where is the Round Bottom Branch on the west side with respect to the State of West Virginia?

A. Round Bottom Branch is entirely within the State of West Virginia.

Q. And that is indicated by what on this photograph?

A. The creek is indicated by the legend "Round Bottom Branch" written along its course.

Q. And the black line is the line by which you indicate it?

A. No, the black line is intended to represent the dividing line between Mercer County and Summers County, West Virginia.

Q. I don't understand you then with regard to the creek?

A. This is the creek.

Q. What is the creek?

A. The creek is shown on the aerial photograph. The water course may be distinguished entering the map at the north and following down approximately along the county line and entering the river immediately adjacent to the county line.

Q. And where it enters the river in what state is it, according to your photograph?

A. The creek enters the river or the creek, I would say, is entirely in the State of West Virginia, the state line, at that point being the bank of New River. As soon as the water is discharged—that is not correct. The waters of New River adjacent to Round Bottom and upstream from the point where the creek enters are in Virginia as shown on this map. Round Bottom itself is the area of land of light tint shown between the thin white line which indicates the county road and the river bank which lies just below it.

1526 Q. What does the red line indicate that is apparently on the border of the river, on the left bank?

A. The red line indicates that while that portion of the land of Round Bottom which lies upstream from Round Bottom Creek is in the State of West Virginia, the river bordering on it in the State of Virginia.

Q. So that if you were loading a barge or boat or bateau on the bank of the land which you have described, you would be in West Virginia; is that correct?

A. That is correct.

Q. And when you pushed that boat out into the stream you would be in Virginia?

A. That is correct.

Mr. THOMPSON. I am not sure whether I have offered Government Exhibit No. 184 in evidence.

Mr. JACKSON. I thought it was withheld when it was offered before.

Mr. THOMPSON. I thought I had offered it in evidence, but if not, I will do it now.

Mr. JACKSON. We make the same objection and I assume the court will make the same ruling?

The COURT. Yes.

Mr. JACKSON. We note our exception.

Cross-examination by Mr. JACKSON:

Q. Mr. Gerdes, on what date was it that you made this last expedition on New River?

A. July 22nd.

Q. Of this year?

A. That is right.

Q. And you made that in a boat about sixteen feet long?

A. Correct.

Q. Four feet wide?

A. Five feet wide.

Q. And how many men were in the boat?

A. Four.

Q. You started this trip at London dam?

A. That is right.

Q. And what time of day was that?

A. About eight o'clock in the morning.

Q. You found out that you could navigate this craft successfully through the pool above London dam?

1527 A. That is right.

Q. Until you got up as far as Booneville?

A. Boonesboro.

Q. That was up where the pool was beginning to get shallow, was it?

A. That is right.

Q. And at that point you got out and dragged the boat through the shoal there, as I understand you?

A. At that point we made part of the shoal with the boat and after striking the propeller a number of times on the bottom we decided the most rapid way of getting through would be to pull the boat along for a distance until we came to a point where there was more clearance and we thought we could trust the motor again.

Q. You thought that was the most prudent way to get through the shoals, didn't you, under the circumstances you found there?

A. I would use the word "expeditious."

Q. It was a question of speed with you rather than prudence, was it?

A. I think all of my acts were motivated with due regard for prudence.

Q. You were not going anywhere in a special hurry at that time?

A. I don't understand what you mean by "special hurry."

Q. You had no engagements you were trying to keep?

A. I had regard for the fact I was trying to accomplish an objective and I didn't stop and look around. If that is what you mean.

Q. As a matter of fact do you think you would save any time worth mentioning between dragging the boat through the shoals and guiding it through, driven by its own power?

A. You are inquiring for the reason?

Q. I want to know if the reason you dragged the boat through those shoals was because you deemed it the prudent thing to do?

A. I thought it was the most practical thing to do.

Q. When you say it was the most expeditious thing to do, do you mean you could walk through the shoals dragging the motor boat quicker?

1528 A. I could pull the boat through the shoals without using the motor faster than I could run around trying to find an opening, to find the real one. Intending to make only one trip. I didn't deem it proper to make a survey of the channel. I took a good look at the channel and when I made a bad guess I went back.

Q. You were having trouble finding a place to get through?

A. Yes; and not finding it in a short time I went ahead through a place fairly suitable, though it might not have been the best.

Q. And dragged the boat a quarter of a mile?

A. Between an eighth and a quarter.

Q. Then you got up to Kanawha Falls?

A. That is right.

Q. And you dragged the boat around Kanawha Falls, is that right?

A. We carried the boat around Kanawha Falls.

Q. Then you launched it on the pool above the dam?

A. Yes, sir.

Q. You found it was possible to navigate a sixteen foot motor boat by that pool?

A. Yes; that is right.

Q. And you traveled with a sixteen foot motor boat about three miles?

A. That is right.

Q. I understood you to say that you then arrived at a rapids below the Hawk's Nest pool?

A. That is right.

Q. And then between that rapids and Hawk's Nest is there another natural pool?

A. Do you refer to the Hawk's Nest Power Plant?

Q. Yes.

A. That is right.

Q. This pool you came up in below Hawk's Nest is what is called the Glen Farris pool ordinarily, or at times?

A. I believe so.

1529 Q. And after you got to Hawk's Nest how did you get the boat any farther upstream, did you carry it again?

A. To what point do you refer by Hawk's Nest?

Q. To this natural pool below the Hawk's Nest Power Plant, how did you get from there?

A. We ran down the river again, out over the rapids, and down through the Glen Ferris pool and took the boat ashore above the Gauley bridge.

Q. How did you get it to Hawk's Nest?

A. On a trailer.

Q. How far was that?
A. A few miles.
Q. Six or eight miles?
A. I think so.
Q. So you hauled the boat on a trailer six or eight miles and launched it again?
A. That was the practical thing to do.
Q. And on the Hawk's Nest pool you found it possible to navigate this sixteen foot motor boat about three miles?
A. That is right.
Q. And then at the upper end of the pool it became too shallow to go any farther?
A. I didn't try. My orders were to navigate the Hawk's Nest pool.
Q. The purpose of this expedition was to establish the fact that in the London pool and pool back of the Glen Ferris dam and the pool back of the Hawk's Nest dam, it is possible to navigate a sixteen foot motor boat, is that right?
A. I don't see why you should limit it to that, limit the navigation to a sixteen foot motor boat.
Q. That is what you had?
A. Yes; but a fifty foot boat would have done just as well.
1530 Q. Been a little heavier to carry at carrying places, wouldn't it?
A. We are speaking of the navigation.
Q. I am asking you now about the carrying places?
A. A fifty foot motor boat would be heavier to carry than a sixteen foot motor boat.
Q. Have to have a larger crew?
A. To navigate or carry it?
Q. To carry it?
A. I think it would all depend—more men to carry it.
Q. You have given the whole extent of all the navigating you did on July 22nd down on the Kanawha and New Rivers?
A. I think so.
Q. What time of day was it when you got up to the head of Hawk's Nest?
A. To what point do you refer?
Q. What time of day was it when you finished this experiment in navigation?
A. What do you call experiment in navigation?
Q. Just answer my question.
A. I considered I made an actual trip.
Q. If you don't understand the question I will ask you another. What time of day did you finish whatever navigating you did July 22, 1936 on the Kanawha and New Rivers?

A. At half past five we took the boat out at the Hawk's Nest.
Q. That was the end of your navigating that day?
A. That is right.
Q. Did you go back to London?
A. I did not.
Q. What did you do with the boat?
A. Went back to Hinton.
Q. Take the boat with you?
A. That is right.
Q. How did you take it?
1531 A. On a trailer.
Q. How many miles was it from where you took the boat out to Hinton?
A. I don't remember.
Q. What was the speed of this boat in slack water?
A. Why the cruising speed was approximately six miles per hour.
Q. How many miles was it from where you started at London up to Hawk's Nest?
A. You speak of miles according to what definition?
Q. Miles by river, if you know?
A. You mean miles traveled by the river?
Q. The length of the river between those points?
A. I haven't got that.
Q. You testified about the water flow at the time you made this other trip at Bulls Falls on the evening of July 27th, and said you found the current at Hinton was 2.6 miles per hour.
A. The 2.6 figure referred to the speed of the propagated power wave.
Q. Where?
A. In that stretch of the river.
Q. Where did you get that figure?
A. I calculated it myself.
Q. From what?
A. From the time that the same power wave passed two gaging stations on the river. [Witness referred to notes.]
Q. You don't remember what you calculated it from?
A. I don't try to remember all the details of this business. [After referring to notes.] That 2.6 miles per hour was the velocity of a power wave traveling over the stretch on New River between Glyn Lyn and Pack Ferry, gages.
Q. You determined that by taking the time interval between certain gage heights at Glen Lyn and Pack's Ferry?
1532 A. I might say I determined it by determining the time interval between the passage of the same wave crest between Glen Lyn and Pack's Ferry.

Q. Who told you what it was?
A. I identified it from the gage charts.
Q. Did it say on the gage charts it was from Byllesby dam?
A. No other places up there it could have been from.
Q. That was an assumption on your part?
A. An assumption derived from my experience as a hydraulic engineer.

Redirect examination by Mr. THOMPSON:

Q. You testified you got the boat out, and to use the normal expression, you portaged it around from the Glen Lyn or Glen Ferris pool up to the pool of the Hawk's Nest?
A. Yes, sir.
Q. Why did you take that boat out and portage it?
A. Because there was no water in the river between those points and no way to get the boat up there.
Q. Where does the water go?
A. Through the tunnel and Hawk's Nest power plant.
Q. That is practically dry for a stretch of five miles?
A. The river is practically dry between the Hawk's Nest dam and Hawk's Nest power plant.
Q. And this tunnel carries 9000 second feet, doesn't it?
A. That tunnel will carry 9000 second feet.
Q. So when you portaged it that was because there was no water in the river?
A. That is correct.

Further cross-examination by Mr. ABBOT:

Q. Will you kindly take Exhibit 184, Mr. Gerdes, and indicate where is located on that exhibit the mouth of Round Bottom Branch which flows into New River on the west bank which is the left bank as you face downstream?

1533 By the COURT:

Q. Counsel on both sides refer to the right and left bank of the river. Is the accepted terminology that the left bank or right bank always means in the direction in which the stream is flowing? When you speak of the left bank of a river, does it follow that the left bank means the left bank facing in the direction in which the stream is flowing?
A. That is correct. It is the accepted practice among engineers to speak of the right and left bank of the river when the viewer places himself in a position facing downstream. The mouth of Round Bottom Branch, as shown on the original of Exhibit 184, appears at a point approximately 1/8 inch, or better stated, 50 feet upstream from the corner of the state line at the left bank of New River, which corner is also the corner common to the counties of Mercer and Summers, West Virginia.

By Mr. ABBOT:

Q. What you refer to as the corner of the state line is the point where you say the state line, crossing the river from east to west, strikes the west bank of the river?

A. That is correct.

Q. And the distance you gave is what you scaled from the map?

A. That is correct.

Q. And that was platted from photographs, as I understand?

A. That is correct. No, I beg your pardon. That is not correct. That point was established from the descriptions which I read you yesterday.

Q. The point that you speak of now is where the supposed state line (by you) strikes the west bank of the river, is it not?

A. That is correct.

Q. You weren't talking about the mouth of the Round Bottom Creek on the left bank of the river?

A. To what point in my testimony do you refer?

Q. The last answer that you made?

A. I am still not very definite on just what you refer to.

1534 Q. I refer to the distance of the mouth of Round Bottom Branch on the left bank of the river above the point where you say the state line strikes the left bank crossing from the opposite side of the river?

A. If I may restate that, as shown by this map, the mouth of Round Bottom Branch is approximately 50 feet upstream from the common corner of the state line and Mercer County and Summers County, West Virginia.

Q. As shown on that map or mosaic?

A. As shown on Government Exhibit 184.

Q. How far did you say that was on the scale in inches?

A. Approximately an eighth of an inch.

Q. Would that not be 80 feet rather than 50?

A. No; because you are looking at a reduced scale map. It is an eighth of an inch on the original, approximately 50 feet.

Q. The visual scale would be no different on the reduced map, would it?

A. You mean the picture or ratio scale shown on the sheet?

Q. Yes.

A. No, that would be correct on your copy also.

Q. Doesn't that give you 80 feet rather than 50?

A. If you wish me to scale it—I took it off by eye. I will say 50 feet.

Q. That is what you compute by scaling it on the map?

A. That is right.

Q. I hand you the Dublin, Virginia-West Virginia sheet of the Geological Survey, marked for identification Defendant's Exhibit

No. 518, and will ask you to describe where the state line is in the section about which you have been testifying to as is shown on that map?

A. On the Dublin sheet of the United States Geological Survey which was surveyed in 1884, the state line is shown intersecting New River at Wylie Falls and then proceeding upstream in the middle of the river a distance of approximately a mile, then leaving the river and proceeding in a general easterly direction. I may add that this map was surveyed in 1884 which, if I recall the date of the other map correctly, is 30 or 40 years previously.

By Mr. THOMPSON:

1535 Q. Later, you mean?

A. The Dublin sheet was surveyed 30 years prior to the Peterstown sheet. The Dublin sheet is on a scale of 1 over 125,000 or 2 miles to the inch, and being made 40 years earlier, was made during a period when the requirements of mapping were not nearly as exacting as they were later. This fact is well known to engineers. The scale on the Dublin sheet is two miles to the inch. The scale on the Peterstown sheet is one mile to the inch. The Peterstown sheet is 30 years later in time and is in every way a more accurate, more detailed map.

Mr. ABBOT. If your Honor pleases, I desire to move to strike out the argumentative portion of the witness' answer.

A. I am stating a fact well known to all engineers.

The COURT. I will let it stay in.

Mr. ABBOT. We except to your Honor's ruling.

By Mr. ABBOT:

Q. Mr. Gerdes, I will ask you to file with your testimony Defendant's Exhibit No. 518 about which you have just testified.

NOTE.—This sheet was filed in evidence, marked Defendant's Exhibit No. 518.

Q. Mr. Gerdes, I will ask you to look at a map entitled "Scarborough's New Census Map of Virginia, West Virginia, Maryland, Delaware and District of Columbia," published by the Scarborough Company, Indianapolis, Indiana, which is marked for identification Defendant's Exhibit No. 519, and observe the point on New River where the state line between West Virginia and Virginia purports to strike it. Do you find that point on the exhibit?

A. Not yet.

Q. Are you looking for it?

A. Yes; I am searching diligently for it.

Q. Do you find that point, Mr. Gerdes?

A. Yes, sir.

Q. Does not the state line as shown on that map in and around the section in controversy generally conform to the line as shown on Defendant's Exhibit No. 518?

A. I would say that this map, which is a generalized map on a scale of one inch equals eight miles, is so generalized, due to the necessity of covering four states on one sheet of paper, that it could not be expected to show this detail. As a matter of
1536 fact, it is impossible from this map to form any judgment as to the exact or even relative position of the state line in the vicinity of Wylie Falls and Round Bottom.

Mr. ABBOT. I ask that that answer be stricken out as being argumentative and unresponsive and I ask the reporter to read the question again and I would like for him to answer it.

Q. (The question was read.)

A. It is impossible to state whether or not the state line shown shown on this map, Exhibit 519, conforms to the state line shown on Defendant's Exhibit No. 518 because of the scale of the map, Defendant's Exhibit No. 519, which does not permit showing the detail which would be necessary to make an answer to that question.

Q. Is it not a fact, Mr. Gerdes, that on Defendant's Exhibit No. 518 the state line from the left——

A. You are speaking of the Dublin sheet now?

Q. Yes; Defendant's Exhibit No. 518—strikes Wylies Falls and then immediately proceeds upstream to a point about a mile and then continuing in that general direction towards Peterstown and that on the Peterstown sheet which you introduced on yesterday the state line from the left strikes the river at Wylies Falls, and then proceeds down the river for about a mile and a half and then takes a general course towards Peterstown up the river?

A. May I have those two sheets and compare them and have the question read?

Q. (The question was read.)

A. That is correct. My general comment as to the accuracy of the two sheets from an engineering standpoint has been noted earlier. The Dublin sheet antedates the Peterstown sheet by some thirty years and, as is well known to engineers, was not made to the same standard of accuracy.

Mr. ABBOT. Again I move to strike out his general comment as being unresponsive, irrelevant, and immaterial.

The COURT. Let the answer stay in. Have you ever gotten an answer?

Mr. ABBOT. Yes, sir, I got the answer but he made a little argument.

By Mr. ABBOT:

Q. Does the line as shown on Defendant's Exhibit No. 519, and by that I mean the state line, proceed down the river in any particular after it strikes the river on that map?

A. This map is very generalized and it is not possible from it to form any firm opinion as to the exact location of the state line in the microscopic portion of the map to which the question refers.

Q. I don't want your opinion, Mr. Gerdes; I want you to state the facts that I asked you. Does or does not the state line as shown on that map strike Wylies Falls and not go downstream at all?

A. Well, sir, in the first place Wylies Falls are not shown on this map.

1537 Q. It is not?

A. You can show it to me if you can find it.

By Mr. THOMPSON:

Q. Where is the river?

A. I have been trying to find it. It seems to be this line between the two railroads.

By Mr. ABBOT:

Q. You say the map does not show Wylies Falls?

A. No, sir; it does not.

Q. Is it or is it not a fact that when the state line strikes the river from the left bank or the right bank, either, it does not go down the stream at all?

Mr. THOMPSON:

Q. Are you asking him now to testify with respect to this map?

Mr. ABBOT:

A. Yes.

A. Well, sir; I cannot answer your question. The most that can be shown from this map is that there appears to be an area where Giles, Mercer, Summers and Monroe Counties come somewhat close to each other and which I take to be in the general vicinity with which we have been concerned. That is the most you can get out of this map.

Q. That is the most you can get out of it?

A. Yes, sir.

Q. Is it a fact that according to the Peterstown sheets and the Dublin sheets, both of which are in evidence, the line on the Dublin sheet leaves the right bank of the river approximately two and one-half miles above where the line leaves the right bank of the river on the Peterstown sheet?

A. May I have the sheets and compare them and check that before I answer? May I have the question read?

Q. (The question was read.)

A. May I ask Mr. Abbot in what manner you are measuring this two and one-half miles? Is that a straight line along the river?

Q. Along the river?

A. By scaling the two quadrangles I find that the state
1538 line, as shown on the Dublin sheet, dated 1884, is shown leaving the river on the right bank at a point approximately two and one-half miles upstream from the position shown for the state line leaving the river on the right bank on the Peterstown sheet dated 1913 and 1923.

Mr. Gerdes, I direct your attention to a map entitled "The Middle Atlantic Group, comprising Virginia, West Virginia, Maryland, Delaware and the District of Columbia," published by the National Survey Company, copyrighted 1916, marked for identification Defendant's Exhibit No. 520, and will ask you to observe on that map the point where the state line between Virginia and West Virginia crosses New River.

Q. Do you observe that point, Mr. Gerdes?

A. To which point do you refer now?

Q. In this section that we are talking about where the state line between Virginia and West Virginia crosses New River?

A. Yes, sir; I observed that point.

Q. Does not the state line in the section mentioned conform to that as shown on the Dublin sheet, Defendant's Exhibit No. 518.

A. Sir, I will say that this map is a so-called commercial map, treating generally such things as population, statistics, and railroad lines and distances between principal cities, and the scale is one inch equals ten miles and it is impossible to determine with any degree of positiveness just what the exact relation of the state line is in the vicinity referred to by counsel.

By the COURT:

Q. You mean by that you cannot answer Mr. Abbot's question?

A. That is correct.

By Mr. ABBOT:

Q. Mr. Gerdes, isn't it perfectly plain on this map that the line from the left strikes the river (the state line I am talking about) and then proceeds in a direction towards Peterstown and not down the river?

A. Well, sir, the portion of the map to which you are directing my attention consists of apparently three lines on a space of 1/32 of an inch, the actual distance shown on the map, and I am not

willing to say just which of those three lines represents the state line and which represents the bank of the river.

Q. You mean to say you are not willing to say that is the state line going down below the "D" in "Elgood" and striking the river?

A. You are not pointing to the state line. You are not pointing to the line with the two dots.

1539 Q. Isn't that the state line?

A. That is the state line [indicating].

Q. You are willing to say that is the state line, aren't you?

A. Just a minute now. Let me check it. I am afraid I will have to look at that map right side up to get the county names.

Q. I wish you would. It would save a lot of time.

A. Will you show me again, Mr. Abbot, just what you are referring to.

Q. I am referring to the state line. It is perfectly apparent to me.

A. What is it you wish to know about that line?

Q. It is a fact that it does not go down the river after it strikes New River from the left, isn't it?

A. Well, I am not sure I know just what you are driving at.

Q. What I am driving at is to demonstrate the fact that the state line on that map, defendant's Exhibit No. 520, corresponds generally to the state line as shown on the Dublin sheet or Defendant's Exhibit 518?

A. Well, sir, I regard it impossible to make any definite determination as to the state line on this map. All that can be said about the state line on this map is that it lies between the states of Virginia and West Virginia, as I have already said.

Q. In what respect is it inconsistent with the line as shown on the Dublin sheet?

A. Well, to the extent to which it shows the state line which is to a very generalized degree; that is, to the degree of accuracy as to which it shows the state line to a generalized degree it is not inconsistent.

Q. It doesn't take a scale to show whether a line after it hits a river goes downstream or upstream, does it?

A. That is a general question?

Q. Yes.

A. I would not say that it did.

1540 Q. Mr. Gerdes, I direct your attention to Defendant's Exhibit #521, marked for identification, which appears to be the latest official survey of Virginia, Maryland, Delaware and the District of Columbia, indexed with population according to 1930 census, published by the National Map Company, Indianapolis, Indiana, and will ask you to look at this map, at

the point where the state line between Virginia and West Virginia crosses New River.

A. I am looking at it.

Q. Will you please state whether the line is shown on that map does not generally conform to that shown on the Dublin sheet, or Defendant's Exhibit #518?

A. Would you define "generally" as a term meaning within one or two miles?

Q. In a way consistent with the Dublin sheet?

A. Unfortunately on this map the river doesn't appear to be shown at the point where the state line is in the vicinity you mentioned. There is a town name written across it. You will notice the name "Rich Creek" is written here and a portion of the river omitted.

Q. Can you answer my question?

A. I would like to ask you to define a little more closely what you mean by "consistent."

Q. What I mean, Mr. Gerdes, is the line as shown on that map, is in general conformity, I don't mean of course by scale and in minute detail, but in general conformity with the line shown on the Dublin sheet; in other words, it strikes the river from the left, and then goes up the river?

A. Well I could not say that from this map, all I could say is going from west to east the state line crosses New River.

Q. Would you be good enough to state, Mr. Gerdes, in what respect it is generally inconsistent with the Dublin sheet?

1541 A. It is inconsistent in that in the vicinity to which you have directed my attention there is not sufficient detail shown on the map, #521, to enable one to express a definite opinion. May I say or have the record show this last map is another general population and railroad distance map.

Q. Now, Mr. Gerdes, I direct your attention to Defendant's Exhibit #522, marked for identification, which is Rand McNally standard map of Virginia, pasted in a pamphlet copyrighted in 1935, and entitled "Rand McNally Pocket Maps for Virginia for tourists, travelers, shippers, general commercial and business reference."

By Mr. AIKEN. What is the scale?

By Mr. ABBOT. 13.7 miles to 1 inch, statute miles.

Q. I direct your attention to that map at the point where the state line crosses New River, and will ask you if the state line as shown on that exhibit does not generally conform to that, as shown on Defendant's Exhibit #518, which is the Dublin sheet?

A. This map, which is another generalized map, intended for commercial use, determining populations and railroad distances, the scale of which is approximately 14 miles to the inch, about all

at could be said with respect to the state line in vicinities to
nich you directed my attention is it crosses the river or at least
think that line which is crossed by the state line is the river,
isn't very definitely odentified on this map, perhaps I should
t even make that definite a statement, but I am trying to assist
u. I think even that statement is drawing on my recollection of
evious maps in my endeavor to assist you.

Q. In other words on this map you will go to the extent of
lping us in saying the line strikes the river and crosses it, and
es not go down stream?

A. No, sir; I would not say that. All I would say is the state
ne—well from this map I don't think it could, I don't think
could say the state line crosses the river, since the river is not
identified on the map.

42 Q. Not even to help us?

A. Has this map got a date on it?

Q. It was copyrighted in 1935.

A. May I state to assist you, Mr. Abbot, from my knowledge
an engineer and of maps and making them, these maps are
mpiled from a previous map of the same sort or the U. S.
eological Survey quadrangle, and it is quite natural that the
aps compiled from the Dublin sheet should resemble that sheet
d those compiled from the Peterstown sheet would resemble
at sheet.

Q. So this does resemble the Dublin sheet?

A. I didn't say so. I don't know which sheet it was compiled
om, but if you introduce fifty maps all compiled from one
urce, you might as well go back to the same source, which I
lieve you will agree was the Dublin or Peterstown sheet of the
S. Geological Survey.

Q. Will you point out where on this map we are tal'ing about,
the locality we are talking about, it is generally inconsistent
th the Dublin sheet, in so far as the state line is shown?

A. With respect to the area we have been discussing, it is im-
ssible from this map, Exhibit #522, to form any conclusion as
the consistency or inconsistency with the Dublin sheet.

Q. I direct your attention, Mr. Gerdes, to Defendant's Exhibit
523, marked for identification, entitled "Commonwealth of Vir-
ia, State Highway System, and connections, copyrighted
mmonwealth of Virginia, State Highway Commission, July,
36," and will ask you to state whether or not the state line as
own on that map crosses New River, where it crosses New
ver? Where it crosses New River conforms generally to that
shown on Defendant's Exhibit #518, the Dublin sheet?

A. In response to that I will say New River does not appear to be identified on this map by name and the scale of the map is one inch equals sixteen miles in this case, and it is impossible to form any definite conclusion as to the position of the state line in the vicinity to which we are referring. I call your attention
1543 to the fact this is a generalized map undoubtedly compiled from one of the two basic maps of the U. S. Geological Survey.

Q. It has the virtue of not being a commercial map?

A. It is a tourist highway map, showing the highways principally.

Q. You have no difficulty in locating New River on this map at the point in question, have you?

A. You have shown it to me on so many different maps it is becoming easier to look at that part of the State of Virginia.

Q. Do you not see where New River is on the map?

A. I gather that this blue line situated near Pearisburg and Narrows and between the two lines of railroad shown, is intended to represent New River. I will note it proceeds down to the state line and then stops.

Q. And the state line is the end of it?

A. From this map it might be the end of it or it might run either way along the state line.

Q. And from that point where it strikes the state line the state line takes a general course toward Peterstown, does it not?

A. Well I will say the state line after leaving the blue line, which I take to represent New River describes a path, curved path, and the next point recognizable on the map proceeding in an eastern direction is Peterstown.

Q. And the curve is in that direction?

A. The state line runs in the direction of Peterstown.

Q. And the line approaching the river from the left doesn't proceed down the river at all, but crosses it, does it not?

A. That can't be said from this map.

Q. I direct your attention to Defendant's Exhibit #524, marked for identification, which is a map of Giles County, showing primary and secondary highways, with a graph scale, Com-
1544 monwealth of Virginia, Department of Highways, Division of Surveys and plans, Richmond, Virginia, June 1, 1932 revised; July 1, 1933 revised; July 1, 1934 revised; and revised July 1, 1935. I direct your attention to the location on that map of the state line, where it crosses New River, and will ask you whether that does not generally conform to the state line as shown on the Dublin sheet, or Defendant's Exhibit #518?

COURT. What is the scale of this map?

Mr. ABBOT. It is a graph scale. I don't know what it is, a line with some divisions on it.

WITNESS. It is approximately 1 inch equals 2½ miles.

COURT. Is the scale shown on the map?

WITNESS. No, sir; I scaled it. I believe this map to be a photographic reproduction of a larger map.

Q. Doesn't it generally conform, Mr. Gerdes?

A. I would say that insofar as the natural features are concerned, this is primarily a highway map; and in so far as the river is concerned it appears to be more of a diagram than a map, and it doesn't appear to conform to the Dublin sheet.

Q. The line, however, strikes the river from the left and then proceeds toward Peterstown, does it not, and not down the river?

A. When you are proceeding from left to right it crosses that way, and in the opposite direction the opposite is true.

Q. And doesn't go down the river after it strikes the line, does it?

A. The map is not at all accurate, being more of a diagram than a map, and no conclusions can be drawn from it.

Q. Mr. Gerdes, I direct your attention to Government Exhibit #46, which is the Alstaetter report, which is a preliminary examination of New River from Radford, Virginia, to Hinton, West Virginia, made by Alstaetter, an officer of the Corps of Engineers, and was made to the Chief of Engineers, U. S. Army, November 21, 1912, which is accompanied by a map of New River from Hinton, West Virginia, to Radford, Virginia, approved November 21, 1912, F. M. Alstaetter, Major, Corps of Engineers, and will ask you if that does not show the
1545 state line in conformity with the line as shown on the Dublin sheet, or Defendant's Exhibit #518?

A. Yes, sir; this map with the Alstaetter report, Exhibit #46, appears in the vicinity under discussion to have been reproduced from the Dublin quadrangle of the U. S. Geological Survey, and it conforms with it in the vicinity of Round Bottom or Wiley's Falls.

Q. Now, Mr. Gerdes, I hand you Government Exhibit #119, "Kanawha River and tributaries, proposed improvements," on one sheet, scale 1 inch equals 7 miles, U. S. Engineer Office, Huntington, West Virginia, submitted by Harry Pockras, principal engineer, approved by John Conklin, Corps of Engineers, transmitted without a date December, 1935, U. S. Engineer Office, Huntington, West Virginia, which purports to show various projects built and unbuilt on New River and its tributaries, and will ask you what that shows as to the state line where it crosses the river?

A. I will say the state line as shown by this map approaches the river on the side of the left bank, and that approximately five miles of the state line where one might expect it to leave the river on the right bank has been omitted, so that I cannot say this map enables any conclusion to be drawn as to the state line in the vicinity of Glyn Lyn.

Q. There is just a gap there?

A. Yes, sir. The scale of this map is 1 inch equals 7 miles.

Q. I take it, Mr. Gerdes, when you made your investigation about the state line you had before you the Dublin sheet, Alstaetter map and Government Exhibit #119, did you not?

A. What is Exhibit #119?

Q. The last map I showed you, showing the improvements on the river, and showing a gap where the line ought to be.

A. May I see that last exhibit again? [Exhibit was handed to the witness.] No.

1546 Redirect examination by Mr. THOMPSON:

Q. Will you please take Exhibit #519 marked for identification for the Defendant, and look at it a moment? In the preparation of the Government's Exhibit #184 and the marking of the red lines showing the state line, and the lines showing the Round Bottom Creek, what, if any, Geological Survey data did you follow?

A. No answer.

Q. May be I can make that clearer. Did you follow the Dublin or Peterstown sheet?

A. I did not follow either sheet. I established it from what I thought were more basic sources. I checked my work with the latest U. S. Geological Surveys available, which is the Peterstown sheet, and found it in agreement.

Q. Taking Exhibit #519 marked for identification by the Defendant, what is the scale on there?

A. The scale of this map is approximately eight miles to the inch.

Q. Is it possible from the scale on that map and data on that map to give or have any judgment as to the direction of the state line with respect to the New River, that is the state line between Virginia and West Virginia.

A. It is not possible to give any definite judgment.

Q. Look at Defendant's Exhibit #520, marked for identification. What is the scale on that map. First, Exhibit #519 was made by whom?

A. #519 shows on its face it was published by the Scarborough Company, Indianapolis, Indiana.

Q. Is that a commercial map?

A. Yes, sir; of the kind commonly made and sold for use primarily, I believe, by the public generally, and business executives, in determining how their salesmen are getting along in the territory.

Q. Referring to Exhibit #520, what is the scale there?

A. The scale of this map is approximately 10 miles to the inch.

Q. Is it possible to identify with any accuracy whatever what the direction of the state line is dividing Virginia and
1547 West Virginia, with respect to New River, at Round Bottom?

A. It is not.

Q. Who made that map, if you know?

A. It shows on its face it was published by the National Survey Company, copyrighted 1916.

Q. And is that a commercial map?

A. Yes, sir; that is a commercial map of several states.

Q. How many states are represented on there?

A. Four states, and the District of Columbia.

Q. Now with reference to Defendant's Exhibit #521, marked for identification, what is the scale there?

A. This is eight miles to 1 inch.

Q. Is that a commercial map?

A. It is.

Q. How many states are represented on it?

A. This shows three states and the District of Columbia.

Q. Is it possible to identify with any accuracy whatsoever the relationship of the state line dividing Virginia and West Virginia, with respect to New River at Round Bottom?

A. It is not.

Q. Now with reference to Defendant's Exhibit #522, marked for identification, what kind of map is that? What is the scale of that map?

A. This map shows a scale of approximately 14 miles to one inch.

Q. Is it possible to identify with any accuracy the relationship of the state line dividing Virginia and West Virginia, with respect to New River River at Round Bottom, from that map?

A. It is not.

Q. Now with reference to Defendant's Exhibit #523, being the Highway Division Map of the Commonwealth of Virginia. That is a map as I understood put out by the Highway Commission for the use of travelers in the State?

A. It is. It is rather diagram'atic.

Q. What is the scale there?

1548 A. Approximately 16 miles to 1 inch.

Q. Can you determine with any accuracy from that scale and from that map, the relationship of the state line between Virginia and West Virginia, with respect to New River at Round Bottom?

A. I cannot.

Q. There was another Exhibit, Defendant's Exhibit #524, marked for identification, a map of Giles County. What is the scale of that map?

A. Approximately 2½ miles to 1 inch.

Q. What kind of map is that?

Mr. THOMPSON. I understood him to say he thought it was a reduced photographic map.

Q. Is that true or not?

A. I believe so.

Q. And I believe you have given the scale there?

A. I have.

Q. Are you able by that map to identify with any certainty the relationship between the dividing line between Virginia and West Virginia along New River at Round Bottom?

A. I am not.

Recross-examination by Mr. ABBOT:

Q. You testified about the small scale of these maps. It doesn't make any difference what the scale is in enabling you to tell whether a line goes in one direction or another, does it?

A. That may or may not be true.

Q. When may it not be true?

A. When the data on the map is so crowded it is not possible to say definitely what is represented by a certain line.

Q. In other words, where you can't follow the line?

A. That would be one case.

Q. That would not have anything to do with the scale of the map, but simply be you could not pick it out?

1549 A. Well, you asked me the question in a rather awkward way.

Q. I am awkward, but you will straighten me out I know.

A. Yes, sir, if I may say on maps where the scale is a considerable number of miles to the inch, the term applied by engineers and geographers to designate small features on those maps is known as "generalizing." That is, as maps cover more and more territory, details are suppressed more and more, and on those maps you have shown me, the details which are the ones we have been trying to decide here were practically suppressed, and while on a map showing a small distance a line will have ups and downs, on a generalized map maker will just draw a stated line, and the thickness of the straight line on the map will more than cover the detail we are trying to tell here.

Q. There are no details suppressed on the Alstaetter map, Government Exhibit #46, are there?

A. What is the scale?

Q. At any rate, in answer to my question as to whether or not a scale is necessary to know whether a line takes one direction or another, your answer is the data or the detail of the line are suppressed, that the line is shown incorrectly, and therefore you can't tell which direction the line goes?

A. I would say on a general map the details of the line are not incorrectly shown, they are suppressed. That is very well understood by map makers. It becomes a physical impossibility to show minor details in the line on a map. The thickness of the line may cover up many of these things.

Q. And what we are to believe from your testimony with reference to these maps is the detail between, for a distance of some 2½ miles, along that river, is covered up by the line showing the state line crossing the river?

A. No, sir; I would not have you understand that.

Q. What are we to understand?

(Examination terminated.)

1550 CAPTAIN PHILLIP C. ELSEY

Direct examination by Mr. McCLERNAN:

Q. Please state your name?

A. Phillip C. Elsey.

Q. Where do you live and what is your occupation?

A. 3515 Mooney Avenue, Hyde Park, Cincinnati.

Q. What is your occupation?

A. Manager of River Transportation.

Q. For whom?

A. The Raymond City Coal and Transportation Corporation.

Q. Where is the office of that company?

A. 3220 Carew Building, Cincinnati, Ohio.

Q. What are your duties?

A. Manager of River Transportation, and the operation of two steel steamer boats, 24 steel barges, three derrick boats, three pump boats, and two floats.

Q. What experience have you had in the operation of tow boats and barges on rivers?

A. 26 years' continuous operation, on the Monongahela, Allegheny, Ohio, and tributaries of the Mississippi River and tributary of the Ohio River, continuous operation.

In the year 1912 I received my first class pilot paper.

In the year 1913, I received my Master Paper.

In the year 1920, I was promoted to Assistant Master of Transportation of the Jones and Laughlin Steel Corporation, Pittsburgh, one of the largest corporations on inland waterways.

In the year 1925 I was again promoted to Master of Transportation of the same company, with ten steamers and approximately 300 barges, also million dollar Marine Way, which is a dock for lifting boats and barges.

In the year 1928 I resigned from this company and went in business for myself, acquiring two tow boats and five barges.

In that same year, 1928, I received one of the largest contracts that was ever given by United States Engineers, which
1551 were to be delivered from a point near Pittsburgh to Cairo, St. Louis, Memphis and other ports. After a successful delivery of these forty barges, which were the largest barges that ever floated the Ohio River, the Mississippi and tributaries successfully in the year 1929. In 1930, I was hit by the depression known as the depression of 1929, but it did not hit me until March, 1930. I sold these boats due to the fact that I could see no further business under the circumstances.

In the latter part of the year, 1930, I was engaged in contract piloting. In contract piloting I was paid by the mile, delivering some of the largest boats ever taken out of Pittsburgh, and also some of the smallest. I did that up until 1934.

By Mr. JACKSON:

Q. You continued in that from 1930 to 1934?

A. Yes, sir; in contract piloting.

In the early part of the year, or say about April, Mr. Ben E. Tate, of Cincinnati, contracted me to get up a transportation cost for the purpose of boating coal from Raymond City, West Virginia, about thirty seven miles up the Kanawha River, to a point in Cincinnati, or below Cincinnati, North Bend, Ohio, a total distance of two hundred and sixty miles. I gave him these costs and he decided then to hire me as manager of River Transportation and form this line, starting July 1, 1935, with the boats that I have given previously.

Q. Did you operate afterwards?

A. We have operated to July 31st, completing the first year—to the expectations and as given to him on my program.

By Mr. JACKSON:

From July, 1935?

A. Yes, sir; to July 31st, 1936.

By Mr. MCCLERNAN:

Q. What waters are covered by your Master's license?

A. The waters covered by my Master's license are all inland waterways and the Mississippi River and its tributaries.

1552 Q. What waterways are covered by your pilot's license?

A. The waterways covered by my Pilot's license are the entire length of the navigable Monongahela River; the navigable length of the Alleghany River and the entire length of the Ohio River; that is all. That was the Pilot's license?

Q. Yes, sir. What experience have you had on the Kanawha River?

A. My experience on the Kanawha River has been two trips as far as Pratt, as Master, and two trips to Charleston, and various trips in the past year on my—on our own steamers.

Q. Where is Pratt, West Virginia?

A. Pratt, West Virginia, is about 82 miles.

Q. From where?

A. From the mouth of the river—Point Pleasant.

Q. And Raymond City?

A. Raymond City is about 37 miles from the mouth—Point Pleasant.

By Mr. JACKSON:

Q. How far?

A. About 37 miles; maybe 38; the Government figures vary over the years in different surveys.

By Mr. MCCLERNAN:

Q. Where is Raymond City?

A. Where is Raymond City?

Q. I mean with reference to the locks and dams in the Kanawha River?

A. Raymond City is about 2 or 2½ miles above Lock No. 8.

Q. In the course of your duties as Manager of Transportation, have you had occasion to keep track of rainfall in the New River and Kanawha River watersheds?

A. Yes, sir. That is the main and essential part of my business, due to the fact that I have to load my barges and navigate my boats accordingly.

Q. How do you do that?

A. By communications by telephone to the United States Weather Bureau; river reports; Government locks and
1553 dams and WLW radio station—12:15 P. M.—and also in direct telephone calls to the stations along the water banks.

Q. Do you have occasion to keep track of stream gaging records on the New River and Kanawha River?

A. Yes, sir; morning and evening.

Q. How do you do that?

A. By assistants at the locks and telephone communications and telegrams, and I also do it myself when out on the road.

Q. What transportation operations does your Company engage in on the Kanawha River?

A. Hauling coal.

Q. Between what points?

A. Between Raymond City, West Virginia; North Bend, and sometimes to Louisville, depending entirely upon the sales organization.

By Mr. McCLERNAN:

Q. In the course of your duties, have you had occasion to observe the rise and falls—or any rise and fall in the stages of the water on the Kanawha River?

A. Yes; we do daily; sometimes hourly.

Q. Have you observed any connection between these rises and falls in the stage and differences in gage readings higher up-stream and rain-falls on other occasions—other differences in run-off up-stream?

A. Yes, sir, we do. We observe this due to the fact that conditions have been such that we have noticed there hasn't been any rainfall whatsoever in any tributaries in the Kanawha River down to the London dam.

By Mr. JACKSON:

Q. Since when; can you fix the date?

A. A matter of record will show that, yes, sir. A matter of record will show the dates.

By Mr. JACKSON:

I did not mean to interrupt, but I thought you could tell the dates. It would be very helpful.

A. No, sir; I cannot recall that, no, sir. In intermediate points there between London Dam and Marmet Dam, there was no rainfall—at the same time, below Marmet Dam, to a point 67 miles down the river, which is the mouth of the River, the
1554 river as raised was 3 feet and 4 inches, diminishing—in other words, 3 feet would be below the dam and then at the mouth of the river——

By Mr. McCLERNAN:

Q. What dam?

A. Either dam—London or Marmet, to the mouth of the river, would diminish 3 feet to——

Q. (Interrupting.) You do not understand my question. You started to tell us where the 3 foot difference was?

A. That 3 foot difference was below Marmet dam and then diminished from 3 feet to the mouth of the river 3 or 4 inches.

Q. Are you able to say, Captain Elsey, from your experience in keeping track of stream stages and rainfalls and other causes

of variation of run-off, what caused these variations in height you mentioned?

A. We have investigated and found them due to the fact—there was not any rainfalls whatsoever, which I have stated—we found it was an artificial wave from the Marmet dam, and, in some incidents from the London dam.

Q. Are these fluctuations in flow of any particular importance to your company in its transportation?

A. Very much so, due to the fact that we load our barges at the mines, but the draughts according to the stages of water at the Kanawha Falls, London Dam, Marmet dam, Lock 6, Lock 7—Lock 6 and Lock 8—and, in doing so, we only allow a very small margin to run on.

Q. I do not understand the last part of your answer; "We only allow a very small margin to run on."

A. We only allow, say two or three inches under our barges, due to the fact that they are steel barges.

Q. Is it necessary for your company to use all available water that it possibly can?

A. Yes, sir.

By Mr. McCLERNAN:

Q. How do you determine how deeply you can load your barges?

A. By the Kanawha Falls mark and the stage at Lock No. 6.

Q. You say "stage."

A. Gage—that means the depth of the water.

1555 Q. How do you determine that depth of water?

A. By the lower gage at Lock 6.

Q. Is that a Government gage?

A. Yes, sir.

Q. What happens if you have an unexpected fall in the stage of the water?

A. Our boat is navigating down the river—or navigating—and the boat grounds itself and becomes stuck—the boat and the tow—and we are delayed. We have to go and find out the cause of it, and in finding out and investigating the cause, we found it was an artificial wave—the water had been shut off and the boat had grounded.

Q. Does that mean anything to your company in Dollars and Cents?

A. Yes, sir.

Q. In what way?

A. It delays the boat and the time it takes and requires the men on the job to go to the Government officials to find out the cause of it, and they have in turn to call the dams and maybe

go through six or eight hands, and in that time—maybe one of the officials will be away and you don't get the proper information, and it passes from one hand to another and all the time this——

Q. (Interrupting). What I am getting at is this—I beg your pardon—it is the matter of—can you give us an estimate in Dollars and Cents, what it would be?

A. It may run—it depends on how long the boat is stuck. It costs us $15.00 an hour for a boat laying there with the tow, and we may have to get another boat to pull it off and that may be $7.50 to $15.00 an hour, and as high, sometimes, as $30.00 an hour.

Q. During your experience on the Kanawha River, tell
1556 us how many times such things have happened?

A. About a half a dozen times in the last year with our company.

Q. Do you know whether or not it happened to anyone else?

A. Yes, sir.

By Mr. McCLERNAN:

Q. When barges go aground, do you have anything to do with it personally?

1557 A. Yes, sir; that is one of my main positions—to go to the scene immediately and see that the boat will not lose any more time than possible and see what or who is at fault.

Q. Did you do that on these half dozen times that you have mentioned?

A. Yes, sir.

Q. Are these groundings that you have mentioned dangerous to property and lives?

A. Yes, sir; they are dangerous due to the fact that, in coming down the river, at say a speed of four or five miles an hour, the boat meets or hits an obstruction in the river and the men working on the boat may be throwed over-board and a steam pipe may break and scald a lot of people, besides the damages to the steel barges, and maybe probably sink the boat.

Q. When you say it may sink, are you talking about a steel barge?

A. Yes, sir—a steel boat—it depends on the location as to whether or not we hit rocks or sand.

Q. Would it have any effect during the time of high water, say in times of winter?

A. Yes, sir; one of the objections to the artificial waves is due to the fact that we do not know when they are coming, and in the winter months, the river freezes over and the power dam will shoot water down unbeknownst to the Government——

By Mr. JACKSON. We object to that answer and move to strike t from the record. He cannot know anything about that.

By Mr. MCCLERNAN. He does know a great deal about it.

By Mr. JACKSON. How does he know it was "unbeknownst" to he Government?

By the COURT. Go ahead.

To which action of the Court in overruling said objection, the lefendant excepts, for reasons stated.

By Mr. MCCLERNAN. I will ask that the question and the answer be read. (Question and answer are read.)

A. (Continuing.) All 'right,—unbeknownst to the operator, nd in doing so—it is done repeatedly—and the first thing, we ave a gorge of ice in some narrow strip of the river.

Q. What do you mean by that?

A. A gorge of ice in the evening and all through the day, hrough the 24 hour period, the river freezes, and then the next morning or evening, at some time, the river will rise and breaks hat ice, and when it breaks, the ice starts moving and keeps piling and piling down until it finally creates a gorge.

Q. Have you seen these things happen and observed them yourself?

A. Yes, sir.

Q. Where and when?

A. Last winter.

Q. In the Kanawha River?

1558 A. In the Kanawha, at Buffalo.

Q. Captain Elsey, when these ice gorges formed in the iver, state whether or not there was a power plant on the river?

A. They form in the same place but not like they do on artifiial waves, due to the fact that the Government is in constant ouch at all times and keep extra men for the surveying of the iver, and they notify all boats coming up there to run through nd break certain gorges. Gorges and artificial waves form durng the night unbeknownst, unless it is under Government conrol, so that the United States Engineers know if the water is eing released.

By Mr. JACKSON. We move to strike the last statement from he record. I have great respect for Government control, but I lo not believe it will prevent freezes.

A. I did not say it could prevent freezes. I said the flow.

By Mr. JACKSON. All right.

By the COURT. It may stay in the record.

By Mr. MCCLERNAN:

Q. When did these freezes begin that you have mentioned, so ar as your observation went?

A. They began along—the biggest part of our trouble—along the latter part of December—from December on until—I beg your pardon, is that still under the question of winter?

Q. Either one.

A. We have been having this trouble, off and on, until about the middle of December up until the present time.

Q. Do you know when the power plant at the London dam began to produce power?

A. I just don't know the exact dates.

Q. Can you give us that approximately?

A. I believe in the latter part of December.

Q. In 1935?

A. In 1935.

A. No, sir, not whatsoever.

By Mr. THOMPSON:

Q. You have testified to six instances where you had trouble running aground. Please detail those six instances, stating where they were and approximately when they occurred?

1559

A. I cannot recall the dates off-hand, but it was in the middle of December, below Lock and dam 10.

By Mr. JACKSON:

Q. Of what year?

A. In 1935.

By Mr. JACKSON:

Q. Below where?

A. Below Lock 10.

By Mr. THOMPSON:

Q. Proceed.

A. The second one was below Lock 10.

By Mr. JACKSON:

Q. I beg your pardon. The first was at the——

A. I beg your pardon; the first was at the—the second was at Lock 10; the first one was at Lock 8.

By Mr. JACKSON:

Q. You say the first one was December, 1935?

A. No, sir. Cross that out [addressing the Court reporter]. We was making a crossing from Plymouth to Bear Creek.

By Mr. THOMPSON:

Q. Start again.

A. Cross out everything and we will start over. [Addressing Court reporter.] The first grounding was below Lock 8, making a cross-over at Plymouth Bear Creek.

Q. When?

A. In December—the latter part of December, in the year 1935.

Q. When was the next one?

A. The next one was below Lock 10—the following trip thereafter would be at—would be about seven or eight days thereafter. The next one was at Lock 10.

Q. Was that the fourth or the third?

A. The third.

Q. When was the fourth?

A. The third below Lock 10.

By Mr. JACKSON:

Q. When was that?

A. I do not recall.

By Mr. THOMPSON:

Q. Can you give the approximate date?

A. Say in January.

1560 Q. In January, 1936?

A. Yes, sir.

Q. When was the fourth?

A. The fourth one was in April.

Q. Where was that?

A. Below Lock 11.

Q. When was the fifth or where?

A. Below Lock No. 11.

Q. And at what time?

A. That was about three months ago—May.

Q. When was the sixth?

A. The sixth was just recently—it was below Lock 10.

Q. And about how long ago?

A. About July—around July 1st.

Q. Were you towing boats at that time or scows?

A. Towing barges.

Q. What happened to the barges?

A. They went aground.

Q. In each instance?

A. Yes, sir.

Q. How close to the dams did they go?

A. It was, in the first instance, about two miles below; the balance of the instances about twelve hundred feet.

Q. Were you present on each one of these occasions, Captain Esley?

A. Yes, sir.

Q. How long did it take you to get off the bar or whatever you were on?

A. In the first instance, it was about an hour and a half, due to the fact that we had water from the Government from Dam 8.

Q. How did you get water from the Government—what do you mean by that?

A. We got John Carpenter at Point Pleasant, who is the assistant, and he got in touch with the Lock Master and the Lock Master threw the wicket.

1561 Q. Do you know that?

A. Yes, sir.

Q. You know it yourself, do you?

A. Yes, sir.

Q. How about the second one—how long did it take you to get off?

A. The second one was two or three hours, and we had to be pulled off by the boat Julius Fleishmann.

Q. How about the third—how long were you there then?

A. I think that took us a couple of hours; it took a couple of hours to take that off.

Q. How about the fourth?

A. Not over an hour in the other three cases.

Cross-examination by Mr. JACKSON:

Q. You say it was in 1928 that you received the large contract from the Federal Barge Lines?

A. Yes, sir.

Q. Have you had any business relations with them since then?

A. No, sir.

Q. In 1930, I think you said, you sold your boats; is that right?

A. Yes, sir.

Q. Did you buy any again or not?

A. No, sir.

Q. You said something about being Manager of Transportation for the coal lines?

A. Yes, sir.

Q. From July 1st to 30th, 1935, to July 31st, 1936—am I right in understanding you to say that you are no longer Manager of this transportation service?

A. No, I am manager.

Q. You said something about July 31st, and I thought perhaps you had terminated your connection with them?

A. No, sir.

1562 Q. Now, you said, I believe, that you have a pilot's license for the navigation of a portion of the Monongahela

River, and the Alleghany River, and the Ohio River and perhaps the Mississippi?

A. Not pilot's; no, sir.

Q. You do not have a Pilot's license for the Kanawha River, do you?

A. No, sir.

Q. You, of course, have never acted as a pilot on the Kanawha River, have you?

A. I have acted as a pilot.

Q. Without a license?

A. Yes, sir; due to the fact that I am a Master.

Q. You still acted as a Pilot?

A. Yes, sir.

Q. Captain Elsey, before you entered the employ of the coal company for which you now work, when did you navigate the Kanawha River, if at all?

A. Since 1930—from 1930 up to—off and on—up to 1935.

Q. That is when you were engaged in——

A. Contracting work.

Q. Operating boats of your own or contracting with shippers?

A. When I had my own boats and also after I sold my own boats, from 1930 to 1934, I towed on the Kanawha River under contract piloting.

Q. You acted as a contract pilot?

A. Yes, sir; but in contract piloting in the Kanawha River then, I acted as a cub. May I put in a question there? When piloting in the river, when I have a Master's certificate, I am allowed to pilot any river, as long as there is another pilot aboard with the boat, if his piloting route is extended over that river—I can pilot that boat.

Q. You mean that you were undertaking to act as a pilot merely because you were a Master?

A. Yes, sir.

Q. But you would be required to have on board a pilot who is licensed on that river?

A. Yes, sir.

1563 Q. And when you were engaged in contract piloting, as I understand you, you had with you a licensed pilot operating boats on the Ohio River?

A. Yes, sir.

Q. As I understand you, when you were running your own boats, most of your work was taking cargoes from Pittsburgh down stream?

A. Yes, sir.

Q. And that is the work that you had on the Ohio before you became employed by the present coal company?

A. Yes, sir.

Q. And such work as you had was occasional trips while you had boats and occasional trips when you were acting as contract pilot?

A. We had very little contract piloting with my own boat. I was not a contract pilot then.

Q. I understand; but I was including both in the question.

A. No, sir. I was a contract pilot until 1930, when I sold my steamers. I was only manager of my own line and acting as Master on that boat, and piloted when I went up the tributaries of the Ohio.

Q. The point I am getting at is this—it is not a question about your license, but how much navigating you did on the Kanawha River before you were employed by your present employer?

A. I stated two trips to Pratt.

Q. And where is Pratt?

A. It is 82 miles above the mouth of the river to Point Pleasant.

Q. Near what point on the river is that?

A. Two miles this side of London dam.

Q. That is down stream?

By the COURT. You say this side.

A. This side; the side of the river is determined by the flow of the current—down stream.

By Mr. JACKSON:

Q. What did you carry on these two trips?

A. Gasoline.

1564 Q. Were there any other trips that you made on the Kanawha?

A. Yes, sir; there were two trips for the Charles Ward Engineering Works, bringing their boats down 57 miles under another pilot.

Q. Under another pilot?

A. Yes, sir.

Q. And that 57 miles was from where?

A. From Charleston to the mouth.

Q. That is the extent of the navigating that you did on the Kanawha River before entering your present employment?

A. Yes, sir.

Q. The last two trips were not round trips, were they?

A. No; just one way trips.

Q. Just going down stream?

A. Yes, sir.

Q. Down stream.

A. Yes, sir.

Q. Since you have been working for your present employer, you have been interested in hauling coal, have you?

A. Yes, sir.

Q. And you haul that from how far up the Kanawha River?

A. It is 37 miles, I think; the Government book gives it now as 38 miles, I think.

Q. That is 20 miles below Charleston, downstream?

A. Nineteen miles about, to be exact.

Q. Your operation was to load the coal at Raymond City and take it to North Bend, near Cincinnati?

A. Yes, sir.

Q. And you loaded that in what pool?

A. Loaded in Number 8 pool.

Q. Did you navigate above No. 8 pool at all in that operation?

A. No, sir.

Q. That is as high as you ever went?

A. Yes, sir.

1565 Q. And that now—the channel from No. 8 pool to the mouth of the Kanawha River, is controlled by the old project plant—old wicket dams?

A. Yes, sir; controlled by 8, 9, 10, and 11.

Q. I mean old wicket dam, designed to provide a six foot channel?

A. To provide a six foot channel before the Government had allotted money for these dams and it is now to be made a 9 foot channel.

Q. Yes. But the channel you operated in still is the old channel?

A. No, sir; it is not—we are not.

Q. You are not?

A. No, sir; due to the fact that there has been some dredging in the Kanawha River to exceed the channel more than six feet.

Q. It is your testimony that, according to your information, the Government project, through pool 8, and through pools 9, 10, and 11, is more than six feet?

A. Yes, sir.

Q. How much more?

A. We are now loading to 6 feet and five and have been all through this drought.

Q. Six feet and five inches?

A. Yes, sir.

Q. Do you know the project depth in the Government improvements in the Ohio river above Cincinnati?

A. The Government improvements?

Q. Yes, sir.

A. I don't understand what you mean.

Q. Isn't it a fact that the Government has used a nine foot channel in the Ohio river above Cincinnati?

A. They have used such, but we do not—they did not maintain it at all times.

Q. That is the depth that project calls for, is it not?

A. Yes, sir, that is the project.

Q. It calls for a deeper depth than the old Kanawha project calls for?

1566 A. No, sir, I will not say that now, due to the fact that the Government is now putting the Kanawha River to a 9 foot depth.

Q. Yes; but I am talking about conditions before the present improvement is made?

A. Yes, sir; but wasn't that completed at the time we are talking about over one year?

Q. Is it your testimony that the Government has completed a nine foot channel on the Kanawha?

A. Not completed, but they are taking steps at all times to complete it.

Q. You don't claim that the Government has completed a nine foot channel in the Kanawha in 1935, in the lower part of it?

A. In certain stages of the water, yes, sir.

Q. Is your testimony based on your wide knowledge of this navigable channel that the Government projects in the lower Kanawha River, that is to say, nine feet during 1935 and 1936?

A. Depending on the stage. When you put the question to me, you must——

Q. I am asking you what the Government project is?

A. It depends entirely on the stage of the water.

Q. That is your understanding of the Government project?

A. Yes, sir.

Q. You were trying to load your barges as heavily as you could to get them down the river, were you?

A. I was trying to load them to the stage I thought was safe to navigate the Kanawha River, due to the fact of the improvements that the Government has done up until the present time and the new improved nine foot channel.

Q. I am sure you were. But the point is, naturally, you wanted to get as heavy a load down the Kanawha River as you could?

A. Only what would be safe to bring down under ordinary conditions.

Q. Did you want to load your boat as heavily as you could or not?

A. No.

Q. Is that why you loaded it to within two or three inches of the bottom?

1567 A. No, I loaded it two or three inches of the bottom due to the fact that I knew that was a comfortable stage for me to work on.

Q. How much lower could you have loaded it?

A. How much lower could I have loaded it?

Q. Yes.

A. I didn't like to go over six feet five, depending entirely upon the stage of water.

Q. How much nearer the bottom could you have loaded it than two or three inches?

A. Well, I don't like to go above two or three inches due to the fact that these are steel barges.

Q. You loaded the barge so that it would have as small a cushion between the bottom of the boat and the channel as you possibly could, didn't you?

A. No, sir; I did not.

Q. How much deeper could you have loaded it?

A. Under the circumstances I should have loaded that barge to the draft of water that is below the lock. In other words, if the lock sill had an eight foot seven mark I should be able to take eight feet three inches.

Q. Captain, you understand me. How much heavier could you have loaded your barge than to a draft which left you a clearance of only two or three inches?

A. That is something that cannot be stated due to the fact of the Government improvements now to make this nine foot channel, that there are excavations going on throughout the river that causes us to load according to what I gave in my statement, to the draft marks at Kanawha and below Lock No. 6.

Q. I understand you to say that you loaded so that you had a clearance of two or three inches; is that a fact?

A. According to that gage at No. 6.

Q. Then you don't know what clearance you had; is that right?

A. We have at several places because we gage as we go along.

Q. But all you did is read the gage and assuming the

1568 gage to be right, you think you had a clearance of two or three inches?

A. Two or three inches in some places.

Q. Don't you know that you couldn't possibly load a boat so heavy that it would have less clearance than two or three inches over the bottom of the stream?

A. That depends entirely upon the reaction of the water in the pool that we are in.

Q. Then it is your judgment as a navigator that you could load a boat practically and safely so that the clearance would be less than two inches?

A. I have taken them that the barge had drawed six inches more water than was in the river.

Q. And did you have any trouble grounding then?

A. Yes, sir.

Q. Were you surprised?

A. No, sir.

Q. Is that good navigating?

A. Yes, sir.

Q. I am glad to get your view on that. What was the clearance under this barge that had two or three inches in the Kanawha when you got down into the Ohio towards Cincinnati?

A. What was the clearance?

Q. Yes, under it?

A. Well, that depends entirely. When you state that you must state at a certain point.

Q. Was it more or less?

A. It was more.

Q. Substantially more, wasn't it?

A. Yes.

Q. And, as a matter of fact, if the channel in the Kanawha had been deeper you could have loaded your barge to a substantially deeper draft and taken it down the Ohio to Cincinnati, couldn't you?

A. Depending entirely. We have to govern that due to the distance that we have to run over. 260 miles is a great
1569 distance to carry coal under the circumstances and with projects being built the way they are. We may lose in that a foot and we may allow a foot to six inches to go on.

Q. You say you may lose a foot of draft, you mean?

A. We may lose a foot of draft due to a condition such as a rainfall and the lowering of a bear trap and the rainfall not produce sufficient water in the river to justify what they had pulled off on a bear trap.

Q. Then, as I understand you, as a practical matter, when you are navigating a stream for any considerable distance such as between Raymond City and Cincinnati, you have to allow for possible or probable variations in stage of a foot or a foot and a half?

A. On the Kanawha River?

Q. On the Ohio?

A. On the Ohio River we allow, depending upon conditions as they exist.

Q. Well, I am asking you whether you do for a trip of that ength have to allow for possible variations of a foot or a foot nd a half on the Ohio River?

A. We do not have to, no, sir.

Q. Do you?

A. No, sir.

Q. What did you mean a minute ago when you told me that ou had to consider that?

A. Due to the fact that we have eleven dams in the Ohio River and we have four dams in the Kanawha River, we may lecide to load a certain depth at the mine and at the same time ve will have a rainfall over that particular point and in that particular point that is my position to watch so that I can get s great a draft as possible. I may miss that and start out with hat draft and by the time I get there conditions doesn't exist s I thought for. Therefore the barges come down on a lighter draft or greater draft, as it may be.

Q. And if it is a greater draft than you calculated, you will probably go around?

A. No, due to the fact that we are not loading beyond the project.

570 Q. You think that if you loaded within two or three inches of the bottom and you had miscalculated the rise rom the rain that you would be likely to go aground?

A. Not necessarily.

Q. You say you loaded to six feet five inches in the Kanawha?

A. Yes.

Q. Did you ever load to nine feet down in the Ohio pools?

A. In the Ohio pool?

Q. Yes.

A. May I correct that question? We loaded to nine feet ut not at the same stage that we are loading at a six foot raft. In other words, depending entirely upon the conditions.

Q. For purely local traffic on the Ohio River do you load for ss than nine feet?

A. For purely local?

Q. Local traffic?

A. We load our barges at North Bend to eight feet six, that from North Bend down.

Q. Did you ever have any experience of any groundings on he Ohio River?

A. I have in my career, yes, sir. I have grounded many a me but not due to the fact of unskillfulness.

Q. I am sure of that.

A. But due to the fact that we had a storm and wind and the urrent velocity from a bear trap causing a side current.

Q. Did you ever ground because of a low stage on the Ohio River?

A. Yes; we have grounded in a low stage of the Ohio River.

Q. Did you ever experience grounding in the Kanawha River before December, 1935?

A. No, sir.

Q. Did you ever discuss with anyone when the power plants at London and Marmet started operations before you took the stand to testify?

A. No, sir, I hadn't.

Q. You hadn't thought about that, had you?

1571 A. I didn't think it was necessary.

Q. You detailed a series of groundings which I will designate as grounding No. 1, and so forth, in the order that you stated them. Can you tell me just when Grounding No. 1 occurred?

A. No, sir; I can't.

Q. Did you keep any record of it?

A. We have a record on the boat.

Q. Will you supply the date of that grounding?

A. Yes, sir.

Q. And I understood that that happened below Lock No. 8?

A. Yes, sir.

Q. What time of day?

A. I believe that was about 7:15. It may be an hour one way or the other.

Q. In the morning or evening?

A. Evening.

Q. And you were taking a cargo between Plymouth and Bear Creek; is that right?

A. No, we were taking our cargo from Raymond City to North Bend. Upon leaving Lock No. 8 coming into the bend at Plymouth and making the crossing, which the channel crosses from Plymouth to Bear Creek, we grounded.

Q. You were not making any landing at Bear Creek? That was merely a point going down the river?

A. We made the landing but not purposely.

Q. Do you know how heavily you had loaded your tow?

A. I don't recall that. That will be on the record on the boat.

Q. What kind of a tow was it?

A. Steel boat with eight barges.

Q. One towboat?

A. Yes.

Q. What was the draft of those barges?

A. I am telling you I don't know that.

Q. I don't mean what draft you had them loaded but
1572 what draft will they draw fully loaded?
A. Fully loaded, we have loaded them to nine feet three.
Q. What freeboard does that leave?
A. That gives us—eleven feet makes one foot nine.
Q. What size are they, how long?
A. 175 by 26 by 11. The weight of them is 171 tons light.
Q. Grounding No. 2 was below what lock?
A. Lock No. 10.
Q. And can you fix the date more accurately than that?
A. No, I can't.
Q. Did I understand you to say that was about a week later?
A. Yes, on the following trip, I believe on the following trip. It may have been the second trip.
Q. And on No. 1 grounding you are going to furnish the draft, as I understand, to which you loaded your barges?
A. We have that record; yes.
Q. Bring me the original record, will you?
A. Yes, sir.
Q. Going back to Grounding No. 2, what kind of a tow did you have there?
A. Same kind of a tow, eight barges.
Q. You were going from Raymond City to Cincinnati?
A. That is right.
Q. Can you tell me how deeply they were loaded?
A. No, sir.
Q. Will you furnish the record showing the date and how deeply loaded those barges were?
A. Yes, sir.
Q. And at that time you said you were pulled off?
A. By the "Julius Fleischman."
Q. What time of day was that?
A. 10:30 at night, eastern standard time, I believe.
Q. Have you refreshed your recollection on that lately?
1573 A. No, I just can't get the time. That will show on the log of the boat.
Q. And Grounding No. 3; that was below what lock?
A. No. 10.
Q. And the same kind of a tow?
A. Yes, sir.
Q. Going down stream to Cincinnati from Raymond City?
A. Yes, sir.
Q. Can you fix more definitely the date of that?
A. No, sir.
Q. You said you thought it was when?
A. January.
Q. 1936?

A. '36, yes.
Q. What time of day?
A. Well, now, I just can't recall that.
Q. Will you furnish the record of that?
A. Yes; I will furnish the record for all of this.
Q. And that will include the draft?
A. Yes, sir.
Q. You can't now recall it?
A. No, sir.
Q. Referring to your groundings 4, 5, and 6, can you state any more definitely the dates of those groundings?
A. No, sir, I will furnish that.
Q. Will you furnish those exact dates and also the draft?
A. Yes, sir.
Q. And the time of day?
A. Yes, sir.
Q. As I understand it, these last three trips were also ones of your regular tows of coal from Raymond City down to Cincinnati?
A. Yes, sir. It may vary. There is one particular time I know that we only had six barges and a tow of seven but the log will show that.
1574 Q. Groundings Nos. 4 and 5 were below Lock 11?
A. Yes, sir.
Q. And No. 6 was below 10?
A. That is right.
Q. And they occurred just after you had left the lock, did they?
A. Yes, sir.
Q. Had you locked through in each of those instances?
A. Yes, sir.
Q. And were you out of the channel when you got there?
A. No, sir.
Q. You are sure of that?
A. Couldn't get out of the channel.
Q. You could run into the side, couldn't you?
A. No.
Q. Too wide there?
A. The channel is very narrow and you only have room to get that many barges out, due to the fact—the cause of the sticking was the water falling rapidly.
Q. You stated that you had noticed some fluctuations in some of these pool levels?
A. Yes, sir.
Q. You said that that might very well sink a boat. Do you know of any boats that have been sunk?

A. No, I don't know of any boats that have been sunk.

Q. You also stated that you had seen some groundings other than the ones which you described of your own. Will you state when and where you saw those groundings?

A. I saw a grounding of the "Halley" leaving Lock No. 6.

Q. With six barges?

A. Yes. I don't recall the date of that whatsoever because I just happened to be passing and wanted to say hello to the Captain of the boat and happened to be there at that particular time.

Q. Who was he?

A. Loyal Wright.

1575 Q. When was it, about the month? Can you fix that?

A. If I remember, it was along—I had occasion to go to St. Albans, driving, and in coming over that road I had seen smoke from this boat and had gone to the river. I will have to check up and get the date on that, on my trip to St. Albans.

Q. Was it winter or summer?

A. No; it was in the summer.

Q. This summer?

A. Yes, 1936.

Q. You can't remember what month?

A. No; I just don't recall the month.

Q. And is that the only occasion you now recall where you actually saw a grounding?

A. Well, I believe that that is the only incident that I could state that I actually saw with my own eyes of a boat coming out of the lock and stopping. I have seen boats aground—stopped and watched the maneuverability of them that would make me believe they were aground, but, of course, not seeing them I couldn't make that statement.

Q. Did you ever have the wickets drop suddenly on the Kanawha when you were navigating?

A. Yes, sir; we have. We have had a wicket drop.

Q. When the wickets are dropped, does that affect the navigable depth?

A. Yes; it increases the depth at the foot of the lock materially, but further down not to amount to anything.

Q. It decreases it above the lock?

A. Decreases it above; yes.

Q. And did you ever see a grounding by reason of that?

A. No, sir; I hadn't, due to the fact that in a wicket dropping the Government is right there on the job and as quickly as possible put in some boards to caulk that wicket whenever it may fall or pull it back up in position.

Q. In your experience didn't the Government from time to time lower the wickets on the dam?

1576 A. Oh, yes; that was due to the fact of a freshet.

Q. You spoke about ice last winter. Was that a pretty severe winter on the Kanawha?

A. Yes, sir; very severe winter.

Q. There was an unusual amount of ice on all streams, wasn't there?

A. Yes, sir.

Q. Did you ever navigate in winter on the Kanawha before?

A. No, sir.

Q. And you made a statement that you saw three feet difference below the Marmet dam, didn't you?

A. I didn't say I saw it.

Q. What did you say?

A. I said I received the Government reports of the river being from three feet and then showing a gage of three inches to four inches at the mouth.

Q. You mean you received a Government report that showed that the gage was three feet different from what?

A. Three feet higher than it was the day before at the time that I had received my marks from the previous day.

Q. And will you give the date of that?

A. I haven't got the date of that; no, sir.

Q. Will your records show it?

A. Yes, sir; the United States Government records will show that.

Q. Do you have the record?

A. I don't have that record unless I can get the proper date.

Q. Will you find it the same way you found it before and send us the date?

A. Yes, sir; I will try to locate it.

Q. And then you said you noticed four to two inches on the gages farther down the river?

A. Yes; Point Pleasant, Dam No. 11 right above Point Pleasant.

Q. That is compared with the three feet at Marmet?

1577 A. Yes, sir.

Q. And you never experienced any difficulties from fluctuations in the Kanawha before London and Marmet were constructed, as I understood you to say?

A. No; not that way. I would like to explain that. Due to the fact that the fluctuations would depend upon rainfall and the manipulation, due to the fact that there wasn't any rainfall over that vicinity, this was very pronounced then that the water must be from the Marmet dam or the London dam, due to the fact of no other rainfall.

Q. Will you give me the month when there was no rainfall?
A. Well, the Government has the report of that.
Q. Can you tell me the month?
A. I can tell by my reports; yes.
Q. Will you look that up and let us have it?
A. Yes, sure.
Q. And to make just a short statement, as I understand, everything you have said in this last long answer is that you didn't experience any difficulties from these fluctuations in the Kanawha before the construction of London and Marmet; is that right?
A. Yes, due to the fact of the drought and the rainfall that we didn't have.

Redirect examination by Mr. THOMPSON:

Q. I believe you stated that the Ohio had established a channel of nine feet, under cross-examination, but did not keep it. What do you mean by that?
A. I meant by that that due to the fact of the drought that we have had, it was almost impossible for the Ohio River to maintain a nine foot stage due to the fact that some of the water had gotten away from various pools and wasn't replenished.
Q. Did they have to caulk and needle on those dams, do you know?
A. Yes, sir.
Q. You stated that on one occasion, I believe it was, that you loaded six inches more than there was water in the river
1578 at the time. What was that occasion?
A. Due to the fact that we knew that there was a rain about to exist coming over the country and that it would hit there by the time that we had given orders for these barges to be loaded.
Q. You had heard that this rain was coming?
A. Yes, sir, and we check up with the Government and due to my long experience I can usually tell about some of the weather and some of the rain that we may have.
Q. When you ran aground at these places that you have described as one, two, three, four, five, and six, did you get in touch with the London and Marmet dam keepers?
A. Yes; I did.
Q. Did you check with them with regard to what had happened?
A. Yes, sir; I did, but I don't know who was the man I was talking to. He told me they had stopped the water at Marmet dam.

Q. And how did you get in touch with him?

A. I had to get in touch with John Carpenter at Point Pleasant and John Carpenter at Point Pleasant, in turn, got in touch with the Marmet dam which I assume was the Lock Master and reported back.

Q. And did you check on that later?

A. Yes, sir, and we called up the Marmet dam and they said that they had shut the turbines off.

Mr. JACKSON. I move to strike out all of this last hearsay.

By the COURT:

I think it is hearsay.

A. I said I called the Lock Master.

By the COURT:

Q. You yourself talked with the Lock Master or John Carpenter?

A. I said John Carpenter had talked to him and then he come back and he asked me the question and I went back to the Lock Master and called.

Q. You went?

A. Yes, sir.

By Mr. JACKSON:

Q. Where?

A. At Marmet dam.

Mr. JACKSON. I still move to strike it out as hearsay.

A. Why would that be hearsay?

Mr. JACKSON. I don't understand that the Government can make testimony.

(Counsel for Plaintiff offered in evidence Exhibit No. 189, being a copy of the Report made by the Commission appointed pursuant to the Act of February 14, 1811 of the Commonwealth of Virginia of which Commission John Marshall was Chairman, and Exhibit No. 189A, being a copy of the map accompanying the said report. These exhibits were objected to by counsel for Defendant on the grounds that they were irrelevant because they deal only with the lower end of New River and not with the part thereof involved in Defendant's project, and that they were prepared by a Commission which was not competent to give expert testimony on the subject.

Counsel for Plaintiff offered in evidence Exhibit No. 190, being a series of photostats of originals of 35 maps under one cover and entitled "New River Survey, 1873 and 1878.")

1579 P. A. GRAGNON

Direct examination by Mr. THOMPSON:

Q. Please state your name to the reporter.

A. P. A. Gragnon. My residence is Hinton and I am a Civil Engineer.

Q. What is your present occupation?

A. I am at present in charge of all survey work in obtaining of engineering data for the Hinton suboffice of the Huntington Engineering District.

Q. How long have you been in your present employment?

A. Approximately six years.

Q. In what capacity?

A. Originally as chief of field party and then later in charge of obtaining engineering data and survey work for the Hinton sub-office.

By Mr. JACKSON:

Q. In the sub-office of the District Engineer?

A. No, I have been employed by the Government for six years.

By Mr. THOMPSON:

Q. Have you any survey parties under you?

A. Yes, sir.

Q. How many?

A. A varied number, between six and twelve.

Q. And what are they doing just at this time?

A. We are completing the surveys on the New River in connection with the proposed Bluestone reservoir.

Q. And what territory have you covered in that survey?

A. The territory from the Bluestone dam site up stream to Narrows, Virginia.

Q. How many miles is that by river, if you know?

A. Between 35 and 36 miles.

Q. And is the Narrows included in the pool of the Bluestone reservoir?

A. It is.

1580 Q. You say you have six field parties?

A. Yes, we have six at present. At one time though we had as many as twelve.

Q. How many are in a party?

A. Between five and twelve men to a party.

Q. In this work of surveying on the New River, have you yourself been present?

A. I have.

Q. In what capacity?

A. Well, part of my duty is to supervise the field parties at work and in this way I have had to be in the field quite often with the parties.

Q. As I understand you, you say your survey has included a distance from the Narrows, in Virginia, to Hinton, West Virginia?

A. No, sir; that is through the Bluestone dam site, about two miles above Hinton.

Q. In your survey work in that stretch that you have described, how often have you in a mile crossed that river?

A. About five times a mile, an average of that.

Q. And how have you crossed the river?

A. By a boat.

Q. What kind of a boat?

A. A regulation Government survey boat, about sixteen feet long, five feet wide and drawing eight to ten inches of water when loaded with a party.

Q. And what does the party consist of?

A. Five or six men and survey equipment.

Q. And do I understand you to say you have crossed the river back and forth from the Narrows down to the face of the reservoir?

A. We have, sir; in this way: We are taking cross sections of the New River valley at half mile intervals. As one sec-
1581 tion is completed the boat is then rowed or poled down-stream or up-stream, as the case may be, to the next section and the boat is also used when this cross section is being run.

Q. How many boats have you got in operation in this work?

A. We have had three, sir.

Q. Did I ask you how many times you crossed in a mile?

A. Yes, sir.

Q. Have you had any trouble in this stretch in going up-stream or down-stream with your boat?

A. No, sir; we haven't.

Q. Do you know where Shumate's Falls is?

A. Yes, sir; it is about two miles below Glen Lyn on the New River, just a little above Dr. Shumate's residence there.

Q. Is that within the State of Virginia?

A. That is within the State of Virginia.

Q. Have you had any trouble going through Shumate's Falls?

A. No, sir; we haven't.

Q. Have you ever made any trips from Hinton to the Narrows and back again in a boat?

A. I have.

Q. When did you do that?
A. From July 19th to 21st, 1936.
Q. Was it the same kind of a boat you have described?
A. It was.
Q. How many men did you have in it?
A. Five.
Q. Did you have any motor attached to the boat?
A. We did.
Q. What was the type of the motor?
A. It was an outboard motor.
1582 Q. Did I ask you how much draft this boat drew?
A. You did not.
Q. What does the boat draw when loaded?
A. This boat in operation, with the outboard motor attached to the stern and with this crew of five men and the equipment we had, drew between 2½ and 3 feet of water while operating at four or five miles an hour, its maximum speed.
Q. On your trip where did you start from?
A. We started from Hinton, the highway bridge at Hinton, and went to Narrows.
Q. And then did you return?
A. We did.
Q. How long were you in making the trip?
A. The upstream trip took one full day and from 7:30 the next morning until 2:20 that afternoon.
Q. And of the men that you had on this boat, did any of them know the channel of the stream?
A. One man had boated along the river several years ago but only for a short stretch between Hinton and the mouth of Bluestone.
Q. And no farther up?
A. No farther up.
Q. How about the other men?
A. No, sir.
Q. Did you have to portage that boat at any time?
A. We did not.
Q. On the trip up or down?
A. We did not.
Q. Did you have to portage any of the materials in the boat up or down?
A. No; sir; we did not.
1583 Q. Did you get out of the boat at any time on that trip?
A. We did.
Q. State where you got out of the boat?
A. We got out of the boat at the Narrows or Peter Mountain Falls.

Q. Did you ever take a trip on the river from the Narrows t Allisonia?

A. Yes, sir.

Q. When?

A. I will have to look that up. I am not quite sure of th date—between July 9th and July 13th.

Q. And did you have the same type of boat as des ribed?

A. We did.

Q. The same type of motor?

A. We did.

Q. And drawing the same depth?

A. Yes, sir.

Q. How many men did you have in the boat?

A. Four.

Q. And how long did it take you to go from the Narrows t Allisonia and return?

A. About four days.

Q. Did you stop over night?

A. We did.

Q. You didn't run the boat during the night?

A. We did not.

Q. How long were you going upstream to Allisonia?

A. We were four days going upstream. I may have misunder stood you, Mr. Thompson. I understood your previous questio to have stated that.

By Mr. JACKSON:

Q. Both ways?

A. The round trips took about five and one-half days.

By Mr. THOMPSON:

1584 Q. What is the distance from the Narrows to Allisoni and return?

A. That distance is approximately 144 miles.

Q. I believe you said you went upstream four days?

A. Yes, sir.

Q. What time did it take you coming downstream?

A. A day and a half.

Q. Did you have to portage your boat at any place on the rive going upstream?

A. We did not.

Q. Did you have to portage your boat at any place comin downstream?

A. We did not.

Q. Did you have to portage any of the materials in your boat

A. No, sir.

Q. Either way?

A. We did not.

Q. Did you get out of the boat at all?

A. We did.

Q. Why did you get out of the boat?

A. At these places wh[illegible] we got out of the boat we were unfamiliar with the channel and in some cases also the water was muddy and using this boat drawing 2½ or 3 feet of water, we struck shoals and rather than go on blindly, trying to find our way through, we decided it would be easier to tow the boat through by hand through a shallow place.

Q. Coming downstream how many times did you get out of the boat?

A. Once.

Q. Where did you get out of the boat?

A. At Walker Mountain Falls.

Q. On both of your trips, including the stretch from Hinton to the Narrows and from the Narrows to Allisonia, how many times did you, coming downstream, get out of the boat?

1585 A. Twice.

Q. Where were they?

A. Once, as I mentioned before, at Walker Mountain Falls and the second time at the Narrows, or Peter Mountain Falls.

Q. Did you get back in the boat?

A. At Walker Mountain Falls we got out and looked over the channel, got back in the boat and rowed through it. At the Narrows we stayed out and helped the boat down the falls and got into the boat again and continued our journey.

Q. Why did you get out and stay out and help the boat down the falls at the Narrows?

A. On our upstream trip we hadn't looked over the channel to a very great extent and weren't sure of it and rather than attempt the trip down through the channel, it was quicker and probably easier to lower it through the falls in the same position we had brought it up.

Q. Did you have anybody on the boat going from the Narrows to Allisonia that knew the channel?

A. No, sir.

Q. And had any of those men been over that trip that you know of?

A. No, sir; they hadn't.

Q. Do you know the stage of the river as to flow or height at the time that you made the trip from Hinton to the Narrows?

A. It was about normal summer low water.

Q. How do you know that?

A. Why, by our gage reading at the Hinton office.

Q. Do you know the flow or stage from the Narrows to Allisonia on the trip you made at that time?

A. No, sir; I don't but from our Hinton office readings which I looked into after the trip, the stage was very low, that is, it was about normal summer low water.

1586 Q. In bringing the boat downstream you said you got out at a place—did I understand you to say Peter Mountain Falls?

A. Yes, sir.

Q. And what other place was it you said you got out?

A. Walker Mountain Falls.

Q. And at Walker Mountain you got back in and rowed through?

A. We did.

Q. On this trip what was the length of the combined trips—the two trips?

A. About 220 miles.

Q. What stretch of the 220 miles did you get out of the boat and pull it or push it through the water?

A. Between a mile and a mile and a quarter.

Q. Was that going upstream?

A. That was on both trips, upstream and downstream.

Q. How much coming downstream did you get out—what length, would you say?

A. Probably 200 feet.

Q. Why did you use the boat that you did use?

A. It was the only one available at the time. It is the only one the Government has on hand.

Q. And all of the Government boats are limited to a sixteen foot length?

By the COURT:

Q. What was the length of this boat?

A. Sixteen feet.

By Mr. THOMPSON:

Q. Could you have navigated a longer boat through that trip?

A. We could have.

Q. On your way on these two trips did you see other boats on the river?

1587 A. We did. We saw quite a few boats.

Q. And what was the character of these boats?

A. The majority of them appeared to be flat bottomed boats tied to the bank behind several of the farm houses. There were several ferries also and in three cases that I remember of now we saw two motor boats.

Q. You say you saw a row boat or flat bottom boats? Are they what you term row boats?

A. I think so.

Q. Did you see any of them on the river?

A. We did.

Q. And where were they going?

A. They were going across and some up-stream and some down-stream.

Q. What would you say from your observation as to the number of boats on that river—row boats?

A. We counted fifty boats between Hinton and Narrows, Virginia, and in my opinion, on an average, that is about the ruling number of boats on the river for a stretch of that length and the river is used quite a bit by the people living on its banks.

Q. State whether, in your opinion, from your experience on the river and your experience as a boat man, whether this New River in the stretch which you have described, from Hinton to Allisonia is susceptible of navigation by small motor boats and other boats of shallow draft.

Mr. JACKSON. I object to the competency of the witness to express any opinion as to navigability. I think he has no qualifications as a navigation expert.

The COURT. He may answer it.

A. Yes, it is susceptible of navigation.

Mr. JACKSON. I note an exception.

By Mr. THOMPSON:

Q. Mr. Gragnon, have you read the testimony here of Mr. Gerdes in which he testified that he made a trip through Bull Falls on July 27th?

A. I have.

Q. Were you present on that trip?

A. I was.

Q. I hand you, marked for identification, Government Exhibit 192, being a photogrophic album apparently and ask you if you know what it is?

A. Yes, sir; I do.

1588 Q. What is that?

A. It is an album containing pictures which we made on that trip between Hinton and Narrows.

Q. On what dates?

A. Between the 19th and 21st.

Q. Of what year?

A. 1936.

Q. And what month?

A. July.

Q. On the first page there is some typewritten statement. What is that?

A. That is the table of contents showing photograph number and the appropriate title for each photograph.

Q. Were you present when these photographs were taken?

A. I was.

Mr. THOMPSON. I offer this album, marked for identification Government Exhibit 192, in evidence.

Mr. JACKSON. I object to it because it contains the repeated practice of the Government of offering an exhibit to which they have added argumentative statements. For instance, they show on photograph No. 2: "Showing improved navigation chute one mile above mouth of Bluestone River, looking up-stream," a highly improper method of presenting photographic evidence. They should identify the place but they have no right whatever to write characterizations into such an exhibit and offer it in evidence. I object to it unless those are all stricken out.

Mr. THOMPSON. Your Honor, we will identify each one of these photographs.

Mr. JACKSON. That is no justification for writing out an argument and putting it in an exhibit and introducing it in evidence.

The COURT. It is justifiable to indicate the point at which the photograph was taken and the direction in which the camera was pointing, but there ought not to be any comments on the photographs.

Mr. THOMPSON. May we have the record show that these comments are stricken and we now offer the document in evidence.

Mr. JACKSON. Will you have them physically stricken?

Mr. THOMPSON. We will take a pencil and run through them and blot them out.

By Mr. THOMPSON:

Q. I hand you Government Exhibit 192 and ask you, on the first page, what is No. 1 photograph?

A. No. 1 is a photograph of the boat we used on the trip with the members of the party in it.

Q. In the foreground there seems to be something of wooden material. What is that?

A. That is a ferry boat, sir.

Q. What is No. 2?

A. No. 2 is a scene taken up-stream about a mile above the mouth of the Bluestone River. That is in a rather shallow part of the river. Just in the center of it, though, is where our channel was, the channel we followed on our trip.

Q. On the right hand side in the center?

A. Against the right bank, yes, sir; approximately in the center of the picture.

Q. Turn to the next page and photograph No. 3, what is that?

1589 A. That is a photograph of the same shallow part of the river.

Q. Go ahead.

A. Photograph No. 3 is a photograph of the same portion of the river as photograph No. 2 except that it is shown about a half mile up-stream from there and also showing the channel through which we ran the boat.

Q. And where is that channel indicated in the picture?

A. About in the center of the picture, between the right bank of the river and the island shown here.

Q. Photograph No. 4; what does that indicate?

A. That photograph was taken just after photograph No. 3 was taken, looking down-stream from that same position.

By Mr. JACKSON:

Q. In No. 3 was that photograph taken which way?

A. Looking upstream.

Q. What do you mean by the right bank?

A. That is the right bank looking upstream, going on the up-stream trip. If you prefer having me refer to the right and left bank as you go downstream, I can do it.

Q. I was only trying to get it straight. Engineers here had said you always spoke of the right or left bank looking down-stream and I wanted to know if you followed that nomenclature or not.

By Mr. THOMPSON:

Q. No. 5?

A. No. 5 is still a part of that same channel.

Q. What is No. 6?

A. No. 6 is a pool above that shallow place in the river.

Q. And at what point?

A. It is known as Landcraft's Eddy. I don't know any other name for it. That is the local name. It isn't shown on any map.

Q. Turn to picture No. 7. What is that?

A. That is also a view of a pool just above the Bertha school house.

Q. How far is that up from Hinton?

1590 A. It is about six and one-half to seven miles upstream from Hinton.

Q. What about picture No. 8?

A. No. 8 is the pool below Bull Falls rapids.

Q. How far below Bull Falls rapids is it, would you say?

A. Just below, approximately a thousand or twelve hundred feet.

Q. Turn to the next one.

A. No. 9 is a picture of Bull Falls.

Q. Where is Bull Falls in that picture?

A. Bull Falls is shown extending across the river. It is marked probably by a few black rocks and a white line.

Q. Where did you bring your boat through on Bull Falls?

A. Near the left of the picture, against the right bank, looking down-stream.

Q. And it is on the left bank looking at the picture?

A. Yes, sir; it is.

Q. What is picture No. 10?

A. Picture No. 10 is the pool just below Bull Falls, looking downstream.

Q. What do we see in the foreground of that picture?

A. The motor.

Q. What is picture No. 13?

A. That is the pool above Warford's Ferry and between that point and Indian Creek.

Q. And about how far is that up from Hinton?

A. Approximately twelve miles.

Q. I am told I skipped photographs 11 and 12. Will you please testify with respect to photograph No. 11?

A. Photograph No. 11 is a photograph of the pool above Warford's old ferry, looking upstream from that point.

Q. And what is 12?

1691 A. 12 is the pool below the mouth of Indian Creek. That was taken from a point about a mile below the mouth of Indian Creek, looking upstream.

Q. I believe you have testified to 13, did you?

A. Yes, sir; I have.

Q. Then have you testified as to 14?

A. 14 is a picture taken just at the mouth of Indian Creek or slightly above it.

Q. Looking at the picture, on which side does Indian Creek come in?

A. On the left side of the picture.

Q. And where is the channel, or where did you come with your boat on the river in this picture?

A. Approximately in the center of the picture and showing near the right bank of the stream a series of rock ledges above the water. Just to the right, facing the picture, of these ledges, is the channel which we followed on our trip.

Q. When you say the right bank, do you mean the right bank as you look at the picture or the right bank as you come upstream?

A. The right bank looking downstream.

Q. What is picture No. 15?

A. Picture No. 15 is the shoals at the mouth of Indian Creek or slightly above it.

Q. And what is the black stretch in the middle there?

A. That is the small sand or gravel bar.

Q. What is picture 16?

A. 16 is a picture of the same shoals at the mouth of Indian Creek.

Q. Which direction are you looking in taking that photograph?

A. You are looking upstream, sir, and the channel we followed lies between the island about in the center of the photograph and the right bank of the river, that is the right bank of the river looking downstream.

Q. But the left bank looking at the photograph?

1592 A. Yes, sir.

Q. 17?

A. 17 is what is called Harvey Falls. That is taken from the boat as we approached them.

Q. And where is the channel on 17?

A. The channel is just about in the left center of the photograph. There is a stretch of apparently open water there.

Q. How about 18?

A. 18 is a pool above Harvey Falls.

Q. Have reference to 19?

A. 19 were some minor rapids that we traversed just below Anderson Falls.

Q. And there appear to be some rocks in the background of that picture?

A. Yes, sir.

Q. Where is the channel in that picture?

A. I don't believe the channel is visible in this picture.

Q. It isn't?

A. I don't believe it is.

Q. Where would the channel be?

A. It would be farther to the left of the photograph.

Q. Looking at the photograph?

A. Yes.

Q. And what about 20?

A. 20 is the pool just below Anderson Falls and above this rapids shown in photograph 19.

Q. What is 21?

A. 21 is a picture of Wylie Chute, the chute used by the old boats in navigation through Wylie Falls.

Q. And where is the channel there?

Mr. JACKSON. I move to strike that out. The witness can't know about that.

By Mr. THOMPSON:

Q. Is there an old channel there?

A. It is.

Q. And where is the old channel?

1593 A. This is a photograph of it looking downstream. It is on the extreme right bank.

Q. And that would be looking upstream from this photograph?

A. Yes, sir; it is.

Q. And where did you say that channel was?

A. It is on the extreme right bank looking downstream.

Q. 22; what is that?

A. That is the pool just around the bend in the river from Shumate's Falls.

Q. How is that photograph taken—looking upstream?

A. Looking upstream, sir.

Q. What is 23?

A. 23 is a photograph taken from the same position that 22 was taken except that it is looking downstream.

Q. I notice on the left hand side of that picture some lights and shadows. What does that indicate, on the left hand side looking at the photograph?

A. Those are ripples from the motion of the boat.

Q. Waves?

A. Waves, yes.

Q. And 24?

A. 24 is a view of Shumate's Falls.

Q. Where is your channel at Shumate's Falls?

A. The channel in this photograph appears—it isn't very plain. It isn't very apparent in this photograph, sir, but it is behind these two rocks approximately in the center of the photograph and it goes diagonally through the falls, to the best of my knowledge.

Q. Are we looking upstream in that picture?

A. We are.

Q. And looking upstream how do you approach the channel?

A. We would swing around near the right bank, that is the right bank looking downstream.

1594 Q. But the left bank looking at this picture?

A. Yes, sir; and the channel comes through diagonally across—has a bend in it.

Q. You approach up to where we see those rocks and then turn to the right; is that it?

A. Yes, sir, that is it.

Q. What is picture 25?

A. This is a panorama of Shumate's Falls.

Q. Where is the channel in Shumate's Falls in that picture?

A. The channel comes through in here. It would be pretty hard to describe so the Court can follow it.

Q. Do the best you can. You are looking upstream or downstream?

A. That is taken from the left bank of the river facing downstream, and in this photograph the channel runs past a series of rocks as shown on the first picture of the panorama, just beyond it and between those rocks and the others in the background and then on up through there. It is hard to pick out.

Q. I notice two groups of rocks in the first picture of the panorama and they are a little to the right hand side of the picture as you look at the picture?

A. They are on the extreme right.

Q. Where did your boat go with respect to those two groups of rocks?

A. The channel was so crooked that we decided it best not to attempt it and no one knew the channel, in the second place, so we towed the boat up by hand through the shallow part, just against the left bank.

Q. Against the left bank?

A. Yes.

Q. Looking at the picture, which bank was it?

A. It is the bank in the foreground.

Q. So, looking at the picture, it is the right bank, is it not?

1595 A. No, sir; I believe not. I believe that bank would be called the bank in the foreground.

Q. I don't believe I follow you on that.

A. You see this is the bank I am speaking of.

Q. You say "this" and that doesn't indicate anything to the Court.

A. The bank at the lower part of the photograph. That is the left bank of the river looking downstream.

Q. But this particular photograph I am asking you about, is that picture taken downstream?

A. No, the stream is running upstream from left to right.

Q. So you are going upstream?

A. Yes.

Q. On which side of the river?

By the Court:

Q. The stream is running from left to right?

A. Running upstream from left to right.

By Mr. THOMPSON:

Q. Where did you push the boat through there?

A. Just against the left bank of the stream looking downstream.

Q. Looking at the picture?

A. Just beyond these rocks shown in the foreground, just below those grass-covered rocks.

Q. So that is on the right hand side of the picture?

A. Yes, sir.

Q. Looking at 26, what is that?

A. That is the pool just below Peter Mountain Falls, taken from a point just a short way above the mouth of Rich Creek.

Q. What is that black spot in the right hand corner?

A. That is part of the outboard motor.

Q. What is picture 27?

A. Picture 27 is a view of Peter Mountain Falls taken from below them

Q. I believe you made a trip from the Narrows to Allisonia?

A. Yes, sir.

Q. I hand you an album of photographs, marked for identification Government Exhibit 193, and ask you if you know what that is?

1596

A. Yes, sir; I do.

Q. What is it?

A. The album contains a series of photographs taken between Narrows and Allisonia.

Q. And Narrows is in Virginia?

A. It is.

Q. Allisonia is in Virginia?

A. Yes, sir.

Q. And the views are on what river?

A. On New River.

Q. What is the typing, the page of typing, the first page, in this Government Exhibit #193, marked for identification?

A. It is a detail of the contents, giving certain photograph numbers.

Q. Were you present when these photographs were taken?

A. I was.

Q. What was the occasion for the taking of these photographs?

A. They were made during a reconnaissance of New River, between Narrows and Allisonia, between July 9th and July 13th, 1936, on our upstream trip.

Q. I believe you said you were present when they were taken?

A. I was.

(Exhibit 193 offered in evidence and defendant reserved the right to object to any descriptive matter appearing with said exhibit.)

Q. Please have reference to photograph #1 and tell us what that is?

A. #1 is a photograph of the river, showing the boat in approximately the center, operating under motor-power through the pool below the Pearisburg station of the N. & W.

Q. Do you know what that black marker is in the center of the picture?

A. I do.

Q. What is that?

A. That is the boat we used in our reconnaissance.

1597 Q. Looking at #2 the picture in the upper right corner, what is that?

A. A different view taken at the same place, also showing the same boat in operation.

Q. What is view or photograph #3?

A. A view of the rapids about three-quarters of a mile above the Ripplemead Highway bridge.

Q. Is the boat visible in that picture?

A. It is not.

Q. What is the picture in the lower right hand corner?

A. A picture of the boat in a pool just below the Pembroke rapids.

Q. When you speak of "the boat" do you mean your boat?

A. Yes, sir.

Q. What is photograph #5?

A. #5 is a view of part of Sifford's Falls and Shoals and approximately in the center of the photograph is a boat, in which several men were fishing at the time this photograph was taken.

Q. That is not your boat?

A. No, sir.

Q. What is the picture in the upper right hand corner?

A. A photograph of the boat being pulled through part of Sifford's Falls.

By Mr. JACKSON:

Q. Your boat you mean?

A. Yes, sir, our boat.

By Mr. THOMPSON:

Q. What is the picture in the lower left hand corner, #7?

A. That is a photograph of the pool in below the Whitethorne Ferry.

Q. Where is the Whitethorne Ferry with relation to Narrows and Radford?

A. It is above Narrows and below Radford.

Q. Now with reference to the picture in the lower right hand corner, #8, what is that?

A. A view of the same pool. That was quite an extensive pool, as I remember.

1598 Q. Is there a ferry there?

A. There is.

Q. Turn to the next page, and look at the picture in the upper left corner, #9, what is that?

A. A view of a pool below Radford.

Q. How far below Radford?

A. Just at the outskirts of East Radford.

Q. Picture #10, what is that?

A. That is also a part of that pool below Radford, the highway bridge is visible in the back ground there.

Q. What is the picture in the lower left hand corner?

A. Why that is a picture of us pulling the boat through one of the shallow pools below Radford. We had just broken the pin on the propeller, that is a safety pin on the propeller, and were holding the boat against the current while the pin was being changed.

Q. Are you standing in the boat?

A. We are.

Q. The next picture, in the lower right-hand corner, what is that?

A. A picture of the rapids at Ingles Ferry.

Q. That is picture #12?

A. Yes, sir.

Q. What is the next picture?

A. That picture was taken from below the mouth of Little River looking upstream toward the A. E. P. dam site.

Q. That is the Appalachian Electric Power Company, the defendant here?

A. Yes, sir.

Q. I note what appears to be a bridge in the upper left hand corner, what is that?

A. A railroad bridge.

Q. And what is it spanning?

A. Little River.

Q. That is the entrance of Little River?

A. It is.

1599 Q. What is the picture in the upper right hand corner?

A. A picture taken from the right bank of New River, looking down-stream, a little below the mouth of Little River, looking toward the right abutment of the A. E. P. Company dam site.

What do you mean by that?
The proposed dam at Radford.
What they call the Radford dam?
It is.
In the foreground what do you see in that picture?
A motor boat.
Was that your motor boat?
It was not.
What else do you see in the foreground?
Three more boats.
Have reference now to the picture in the lower left hand
r, #15, what is that?
The aggregate plant at the Radford dam site.
What do you mean by aggregate?
Where the stone is crushed and sorted.
What for?
For concrete abutments or ballast, or whatever they use
.
Have reference now to picture #16, and tell us what
is?
That is a view of the right abutment of the Radford dam
.
State with relation to the river, where that is located?
That is the right bank of the river, looking down-stream.
Is that picture taken of the front of the coffer dam?
That is a little downstream from the coffer dam.
Turn to the next page, picture #17, in the upper left hand
r; what is that?
A view of the same dam site showing the coffer dam in
ximately the center of the photograph.
That is the coffer dam of the Appalachian Electric Power
Company?
A. It is.
Q. I notice a shadow in the corner, what is that?
Probably someone's head in the way.
In the boat?
Yes, sir.
In your boat?
Yes, sir.
Now Photograph numbered 18, what is that?
A view of the coffer dam taken from the river, about on,
parently on the center line of the proposed dam.
Have reference now to Photograph #19, what is that?
That is the pool above the dam site at Radford.
Have reference to the right-hand corner photograph #20?
That is a pool about two miles below Linkous Ferry.

Q. Where is Linkous Ferry with respect to the Appalachian Electric Power Company or Radford project?

A. It is above it.

Q. Turn to the next page in the upper left-hand corner, what is that?

A. The shoals taken just above Linkous Ferry, the camera was on the right bank of the stream, looking downstream at the time the picture was taken.

Q. There seems to be a series of rocks in the background of that picture, what does that indicate?

A. That is a rapids.

Q. Look at photograph #22, the picture in the upper right hand corner, what is that?

A. Also a rapids about one mile below Cox's Ferry.

Q. Is that a picture above the Radford project?

A. It is, sir.

Q. How about Photograph #23?

1601 A. Photograph #23 is a pool above the rapids shown on #22.

Q. And what is #24 in the lower right hand corner?

A. Also a part of the rapids shown in #22.

Q. These pictures you are referring to now, since you have been speaking about the Radford project, are they or not below Allisonia?

A. They are below Allisonia.

Q. Turn to the next page, the upper left hand corner, #25?

A. A pool just below the Hiawassee bridge.

Q. The boat in the left foreground is that you boat?

A. It is.

Q. What is the picture on the upper right hand corner, #26?

A. Part of a pool just below Allisonia, the town of Allisonia is in the background.

Q. #27, what is that, on the lower left hand corner?

A. A picture of our boat tied up on the right bank of the New River at Allisonia, that is the right bank of New River, looking downstream.

Q. I see figures down in the river; what are they?

A. Swimmers, sir.

Q. What is the next view?

A. A view taken at Allisonia on the right bank also.

Q. Turn to the next page, upper left hand corner, #29; what is that?

A. A view taken directly from the boat as we shot the rapids, on our down-stream trip, the rapids one mile below Cox's Ferry.

Q. Where did you go through the rapids in that picture?

A. The picture is taken directly from the bow of the boat. We went through as shown there.

Q. Now Photograph #30, where was that taken?
A. A pool one-half mile above Linkous Ferry.
Q. And the lower left hand corner, Photograph #31; what is that?

A. A picture of the rapids just above Linkous Ferry.
1602 This picture was also taken from the boat while we were going through these rapids.

Q. #32, in the right hand corner, what is that picture?
A. That is a view of the pool just above the Radford dam site. This picture was taken on our down-stream trip.
Q. Turn to the next page. Now photograph #33, in the upper left hand corner, what is that?
A. That is the pool one mile below Radford.
Q. On your down-stream trip?
A. Yes, sir.
Q. What is #34 in the upper right hand corner?
A. A view taken of the Little Pepper Falls, looking down stream above there.
Q. And #35, lower left hand corner, what is that picture?
A. A view of Little Pepper Falls, after we had gone through the Falls, looking up-stream toward the falls.
Q. Where is the Falls in that picture?
A. The Falls extend all the way across the photograph, about the center of it.
Q. Center background?
A. Yes, sir.
Q. What is the picture in the lower right hand corner, #36?
A. #36 is a view, partial view, of Barnett Falls.
Q. Did your boat go through that Falls?
A. We did.
Q. Did your—Turn to the next page, upper left hand corner, #37, what is that?
A. A pool below Barnett Falls.
Q. And the next picture in the upper right hand corner, what is that?
A. The rapids above the Pembroke highway bridge.
Q. And you went through those rapids?

A. We did.
1603 Cross-examination by Mr. JACKSON:

Q. Mr. Gragnon, I notice as Exhibit #193 you have produced some thirty-seven photographs; is that right?
A. I don't know the actual number.
Q. Will you take the exhibit so you will be able to follow me?
A. Yes, sir.

Q. Now is that right?

A. This shows thirty-eight.

Q. Thirty-eight is right, I beg your pardon. Now I notice in the course of your testimony that those photographs, at least twenty-four, are pictures of pools, is that right?

A. Yes, sir.

Q. And did you take twenty-four photographs of pools because you regarded those as photographs of critical points on the river?

A. No, sir, I tried to cover a certain portion of the river and the pools formed a great portion of the river. There were more taken on the pools.

Q. When you came to a good pool you took that pool?

A. Several view of it.

Q. I notice in particular when you got to the pool at the Radford dam site you took some eight or more photographs of the pool, didn't you?

A. Why I believe not. I believe most were taken of the abutments and the quarry.

Q. Will you look at your pictures Nos. 15 to 19, and tell me, in so far as those pictures show, any part of the river, they are not a part of the Radford pool?

A. They are, yes, sir.

Q. Will you look at your picture #32 and tell me if that is part of the Radford pool?

A. It is.

Q. I mean the Radford dam site pool, you understand to what I refer?

A. Yes, sir.

1604 Q. Will you turn and look at your picture #17, in Exhibit #192?

A. Yes, sir.

Q. That, as I understand shows a picture of Harvey Falls rapid?

A. Yes, sir.

Q. That rapid as I look at the picture is in the extreme background, isn't it?

A. Extreme background of the river.

Q. As far as it shows the river?

A. Yes, sir.

Q. Now if you were farther away from that rapid, it would look still smaller, in the photograph?

A. In the photograph it wouldn't.

Q. You could not have gotten any farther away without getting it entirely out of the picture?

A. We could not have gotten farther away and included the whole rapid in the picture.

Q. Could you have gotten any farther away from that rapid and still have had it show in the picture at all?

A. Why, yes, we could have.

Q. Look at the picture carefully before you answer. I want you to measure your words on that.

A. I have.

Q. Do you still adhere to that answer?

A. We could have gotten still farther away and had the picture of the Falls.

Q. It would have been a very small distance further away, wouldn't it?

Q. Do you think you could have gone one hundred yards away and gotten the Falls in the picture?

A. That I can't answer, the bend in the river might have prevented our seeing it. I don't know.

1605 Q. Why didn't you take the photograph closer?

A. We could not have included the Falls in the photograph if taken closer.

Q. Why didn't you take it closer up, a closer up view of the Falls, and show part of it?

A. I don't remember the reason.

Q. You have no idea why you didn't do that?

A. No, I have not.

Q. Will you look at your #19 in the same Exhibit #192, and your #27, and tell me whether or not in each instance the Falls shown in the picture is not in the extreme background so far as the river is shown?

A. They are as close in to the camera as they could be at the time they were taken so they would be included.

Q. Are they in each instance in the extreme background of the picture?

A. They are.

Q. And if they had been taken from a position closer they would look substantially different, wouldn't they?

A. I don't know they would.

Q. That is your best judgment?

A. Some of the detail would have been more apparent, but they would have looked quite the same.

(Exhibit 526 marked for identification.)

Q. I show you photograph marked #526 for identification, and ask if you can identify that?

A. Not positively, but I think it is a part of the Shumate Falls.

Q. That is your best judgment?
A. Yes, sir.
Q. That is based on your intimate study of the river?
A. No, sir, on my visits once or twice to Shumate Falls.
Q. That is any knowledge you have about these Falls on the river is confined to what you gained or remember from one or two trips?
1606 A. That portion of it is, yes, sir.
Q. Which portion?
A. Shumate Falls.
Q. Just Shumate Falls?
A. Yes, sir.
Q. You have always kept away from that except this one trip?
A. No, sir, I haven't. It just happened to be away from the road.
Q. The parts of the river you are familiar with are the parts you can see from the highway?
A. Yes, sir, because most of my travel has been by automobile.
Q. You traveled by automobile when working in connection with this surveying project?
A. Not all of it.
Q. But most of it, as I understand?
A. Yes, sir.
Q. To refresh your recollection, I will ask you if that isn't a picture of Harvey Falls?
A. I refuse to identify it.
Q. Don't you know the road runs right along the river at Harvey Falls?
A. That is a picture taken from down-stream, and I have always seen it from the side.
Q. You have never seen it from the river?
A. Except for these two occasions.
Q. You are testifying about what you learned on these two occasions and didn't you offer a picture taken down-stream?
A. By referring to my notes I could identify it, but I don't feel I could identify that definitely without some means of identification.
Q. Could you refer to your picture of Harvey Falls, what number is it?
A. I may be able to find it.
Q. You have an index and I am sure that must be helpful. Now will you tell me whether or not that was taken from
1607 below Harvey Falls, your picture #17, in Exhibit #192?
A. It was.
Q. And this Exhibit #526 is taken down-stream from the Falls, isn't it?

A. This photograph doesn't cover the entire falls.

Q. In your opinion does your photograph #17 and exhibit #526 exhibit a comparable condition?

A. I don't know. I don't know they are the same falls. I wouldn't answer that.

Q. Do you think that #526 compares with your #17, showing a picture of Harvey Falls taken reasonably close to Harvey Falls, and as far away as one can get?

A. I don't know that is Harvey Falls.

Q. I can't refresh your recollection on that so you can remember it?

A. No, sir.

Q. Now, Mr. Gragnon, you have before you your Exhibit #193, haven't you?

A. Yes, I have.

Q. Will you look at your picture #21 in your Exhibit #193 and tell me whether or not the Falls are in the extreme background of the picture?

A. They are to the same extent, the whole falls to be included in the photograph would have to be taken from that distance.

Q. Whether they had to be or not, we won't argue that, but it is a fact that in all cases you took these photographs so that the falls or rapids were in the extreme background of the picture, in so far as it shows the river at all?

A. No, sir, not in all cases.

Q. You made some exceptions to that?

A. We have, you may look at photograph #26 in the same exhibit.

Q. That does look appreciably different. I will agree with you.

1608 A. And # 22 in the same exhibit.

Q. This #36 what does that show? Isn't there a rock ledge about two or three feet high?

A. No, not that high, about two feet high.

Q. At least two feet would you say?

A. Yes, sir.

Q. How high are Barnett's Falls from top to bottom?

A. Between a foot and a half to two feet.

Q. That is your best judgment?

A. That is my opinion. There are a series of several falls but a foot and a half to two feet should cover all of it.

Q. You are now taking a falls known as Barnett Falls.

A. No, sir, there are some other rapids above that.

Q. Mr. Gragnon, how long have you lived at Hinton?

A. Since November, 1935.

Q. And where did you live before that?
A. In Ohio.
Q. In what part?
A. I moved quite frequently in Ohio. I covered the territory or Ohio river through a narrow strip of the Miskingum District.
Q. Were you working for the Government in the Muskingum District?
A. I was.
Q. For how long?
A. Approximately two years.
Q. What was your college?
A. In Louisiana.
Q. What college?
A. Southwestern.
Q. What degree did you receive?
A. I did not complete my civil engineering course.
1609 Q. How old are you?
A. Twenty-six.
Q. You said this boat was about sixteen feet long?
A. It was.
Q. And about how wide?
A. About five feet.
Q. And about what speed did it have?
A. We had no way of measuring it accurately but my best judgment was between four and five miles an hour at maximum speed.
Q. What kind of motor did it have on it?
A. Johnson out-board.
Q. How many horse power?
A. Twenty-four that is the motor we used on the trip between Narrows and Allisonia was twenty-four horse power, and the motor we used between Hinton and Harrows as a motor of lower horse power, which we could not determine what horse power it was, it wasn't marked.
Q. You had a smaller motor between Hinton and Narrows?
A. Yes, sir.
Q. And you put in a larger motor above Narrows?
A. No, sir, the larger motor was too strong—we made the trip from Narrows to Allisonia and then changed over.
Q. The larger motor was too large for the size of the boat?
A. Yes, it was.
Q. You said you thought it would make how many miles per hour speed?
A. Between four and five miles.
Q. Four and a half be a fair average?

A. I wouldn't say. I just estimate it was between four and five miles an hour.

Q. You went up-stream from Hinton to Narrows?

1610 A. We did.

Q. How long did that take you?

A. We took about one full day, about ten hours on the first day and from 7:30 the next morning until 2:20 that same afternoon. A little over a day and a half.

Q. About ten hours the first day and seven hours the second day?

A. That is right, I guess.

Q. About seventeen hours?

A. Yes, sir.

Q. Do you know how far it is by river from Hinton to Narrows?

A. About thirty-eight miles.

Q. Only thirty-six, isn't it?

A. No, sir, I think it is about thirty-eight.

Q. I understood you to say thirty-five or thirty-six?

A. That is from Bluestone to Narrows.

Q. Where did you leave from?

A. We left from the highway bridge at Hinton.

Q. Above or below Hinton?

A. Right at Hinton.

Q. You didn't leave from the C. C. C. Camp?

A. We stayed there over night one night, yes, sir.

Q. When you were taking this trip up the river, didn't you start from the C. C. C. Camp?

A. We stayed there over night. Probably I should qualify my statement. A portion of the trip between Hinton and the C. C. C. Camp was made on July 8th.

Q. What distance is that?

A. Probably four to five miles. I don't know exactly.

Q. And how long did you take on that trip?

A. About an hour and a half or two hours.

Q. You could have walked in less time, couldn't you?

1611 A. I don't know we could have.

Q. That was on July 8th?

A. Yes, sir.

Q. Did you stay there all night?

A. Yes, sir.

Q. And what time of day was it when you left Hinton, on the day you went to the C. C. C. Camp?

A. About three-thirty in the afternoon.

Q. Why did you not go any farther?

A. We thought that was sufficient for that day. We weren't going to put any over-time in.

Q. Getting late when you got in the camp?

A. No, sir; about five or five-thirty.

Q. Did you start again next morning?

A. We did.

Q. What time?

A. I will refer to my log. We left the C. C. C. Camp next morning at seven-twenty.

Q. And you traveled all that day?

A. We traveled to the mouth of the Bluestone river and arrived there at eight-thirty.

Q. Got to Bluestone at eighty-thirty P. M.?

A. Yes, sir.

Q. And did you stay there for the night?

A. No, we did not. Under instructions from my superior officer I loaded the boat on a truck and drove to Narrows and put it on the river and continued my trip there.

Q. You took the boat out of the river at Bluestone?

A. Yes, sir.

Q. How far was that up-stream from the C. C. C. Camp?

1612 A. Probably a mile.

Q. And then you went by truck to Narrows?

A. Yes, sir.

Q. Why did you do that?

A. I didn't question my superior officer. He gave the instructions.

Q. Who was your superior officer?

A. N. F. Dortch, Engineer in charge of the Bluestone project.

Q. Is that the trip you made?

A. No, sir.

Q. When you went to Narrows what did you do?

A. Started our trip to Allisonia.

Q. And that was on what day?

A. That was on July 9, 1936.

Q. And you proceeded then the next morning on your trip?

A. We left the Narrows that day at 12:50 P. M. on our trip.

Q. Well did you launch your boat above or below Peters Mountain Falls?

A. Above at Peters Highway bridge.

Q. And after launching the boat above the Falls your started at 12:30 or 12:50 P. M.?

A. 12:50 P. M.

Q. What date?

A. July 9, 1936.

Q. Where did you stop then?

A. That day we stopped at some rapids, I think known as the Henley French rapids opposite Curve, Va., a flag stop on the N. & W. We stopped there that night at 7:30.

Q. How many miles did you make?

A. I don't know. I would have no way of estimating it.

Q. Stop below the rapids?

A. Just below.

Q. Why did you stop below?

A. It was a good place to camp, a nice sandy beach,
1613 and we camped there over night.

Q. What did you do then?

A. We spent the night there.

Q. Where did you go next?

A. At 6:45 A. M., on the 10th, we left there and arrived at the lower end of Sifford's Falls at 7:30 P. M.

Q. Lower end of Sifford's Falls?

A. Yes, sir.

Q. You stopped below the Falls?

A. That is over night.

Q. Was that because it was a good place to camp again?

A. Yes, sir.

Q. That was on the 10th?

A. Yes, sir.

Q. Now go ahead and tell me where you next proceeded?

A. On the 11th we left Sifford's Falls at 6:50 A. M., and arrived at Radford at 8:30 P. M.

Q. Were you traveling continuously?

A. We were not that day. The truck driver misunderstood us and our dinner was about three hours late. We waited about three hours for dinner.

Q. The truck driver was following you with supplies?

A. He met us at intermediate points on the river where ever he could.

Q. Why didn't you carry your supplies with you?

A. Four men and the equipment we had, at the time, was quite a bit of supplies in the boat.

Q. How many miles was it from Narrows to Allisonia, about seventy-five?

A. Allisonia was approximately seventy-two or seventy-three miles.

Q. If you were able to proceed without any delays your boat would have covered that distance in about sixteen hours, wouldn't it?

1614 A. What distance?

Q. Seventy-two miles?

A. No, I wouldn't say that.

Q. You all get to Radford on the 11th, what did you then do?

A. On the morning of the 12th we left Radford at 7:00 A. M., and arrived at Lowman's Ferry 6:30 P. M., and on the 13th we left Lowman's Ferry 7:30 A. M., and arrived at Allisonia 2:30 P. M.

Q. Left when?

A. 7:30 A. M.

Q. And arrived when?

A. 2:30 P. M.

Q. You left the Narrows on the 9th and arrived at Allisonia on the 13th?

A. That is correct.

Q. And it took all or a part of five days for the trip, that is the 9th, 10th, 11th, 12th and 13th, all or a part of those days?

A. Yes, sir.

Q. You say that distance is about seventy-two or seventy-three miles?

A. Yes, it is.

Q. Your boat would cover seventy-two or seventy-three miles in about sixteen hours, wouldn't it?

A. That is if we weren't going against the current, and if we were familier with the channel, we might do it. I don't know how much mileage we covered dodging in and out looking for the deep water, but quite a bit.

Q. You lost quite a bit of time dodging about looking for a channel?

A. Yes, sir.

Q. And suffered a good deal of trouble from swift currents?

A. We did not.

1615 Q. Did it slow you up some?

A. Some, yes, sir.

Q. But not substantially?

A. No, sir.

Q. So the time lost was not due to any degree of the swiftness of the current?

A. The current over-all not just over the rapids.

Q. Was Mr. Gerdes with you on this trip?

A. He was not. I beg your pardon, on the trip, that portion of the trip, of the Hinton-Narrows trip, between the C. C. C. Camp and return to the C. C. C. Camp he was.

Q. What day was that?

A. He was with me on the 19th and 20th of July, 1936.

Q. On the 19th of July, 1936 did you have any trouble at Bulls Falls?

A. No, sir, we did not.

Q. Did you pull the boat through?
A. We did.
Q. Did you pull the boat through at Harvey's Bridge on the 19th?
A. We did.
Q. Did you do it at Wiley's Falls?
A. We did not.
Q. You do not agree with Mr. Gerdes on that?
A. We pulled it through on the 20th.
Q. Did you pull it through Shumate's Falls?
A. We did.
Q. And at McDaniel's Bridge?
A. I am sorry I do not know where that is.
Q. Did you at Peters Mountain Falls?
A. We did.
Q. This was the trip you told about on direct making it from Hinton to Narrows?
1616 A. It is.
Q. I believe you said you didn't get out of the boat except a couple of times?
A. I made that statement but I probably misunderstood the question, because I didn't mean it that way.
Q. Did you get out of the boat going from Narrows up toward Allisonia?
A. We did.
Q. Did you get out at Barnett's Falls?
A. We did get out at Barnett's Falls.
Q. And from the Narrows up to Allisonia, going upstream, can you tell me how many times you got out?
A. I can.
Q. Just begin at the Narrows and tell me the first place you got out going up the stream?
A. Between Narrows and Ripplemead we got out six times. I want to qualify my statement here, on our first days journey: I want to state that we were unfamiliar with the operation of the boat and the motor.
Q. You had operated it from Hinton, hadn't you?
A. That was two hours at most.
Q. Didn't you have in your party these men that you say have been under you, going back and forth across these points doing surveying work?
A. No, sir, there was probably only one man who was at all experienced with the river, and I doubt whether he had boated on the river before that between the mouth of Bluestone and Hinton.

Q. I thought you told us on direct examination you had men who had been going back and forth across the pools of this river in connection with surveying work?

A. That is between the Highway Bridge at Narrows and Hinton.

Q. And they had used a boat before?

A. Yes, sir, but we were speaking of the trip above the narrows.

1617 Q. Now tell me the next time you got out?

A. Six times. I want to qualify that statement, that was the first time that any of us had operated an outboard motor. One of the men had some experience several years ago, but we had no experience in estimating the depth of the water in the channel by the eye.

Q. Mr. Gerdes was with you, was he not?

A. Not on that trip. We, of course, estimated it and one time we decided we could not make it with the boat on account of shoals or the water was too swift or some reason or other we could not do it and we waded around near the bank. Later we came back down through this same place without any trouble at all.

Q. You mean going downstream?

A. Yes, sir, with the motor in operation.

Q. If you have made your explanation about getting out of the boat on this stretch, now tell me how many times you got out of the boat on the next stretch, from Hiawassee to Pembroke?

A. You mean from Ripplemead?

Q. Yes, from Rippelmead to Pembroke.

A. We didn't get out of the boat but once and that was at Walker's Creek Bar, and we helped it over one ledge by getting out and lightening the boat and then poled it up the rest of the way.

Q. Didn't you pole it up to Snidow's?

A. No, sir.

Q. But you poled the boat at all of these other places, didn't you?

A. No, sir, there was any number of them that we went up by motor.

Q. Tell me how many times you got out, going up to Pembroke?

A. From Pembroke to Allisonia we got out four times.

Q. How many times did you pole the boat?

A. Six times.

Q. Now I show you this exhibit marked No. 515 for identification and will ask you if you know what that is?

1618 A. Yes, that is Peters Mountain Falls.

Q. Did you go upstream to that falls at any time?

A. We did.

Q. Without poling the boat or getting out of the boat?

A. No, we poled the boat through there.

Q. Every time?

A. Yes, sir.

Q. Did you go down the stream to Peters Mountain Falls without getting out of the boat?

A. I did not, but several of my party did.

By Mr. JACKSON. I move the Court to strike out that evidence as hearsay.

A. It is not hearsay, they went out under my instructions.

Q. Now, how did you happen to make this trip from Hinton to the Narrows?

A. I don't understand your question. How did I happen to make it?

Q. Yes.

A. What do you mean?

Q. Were you directed to make the trip?

A. I was.

Q. Were you directed to make the trip for the purpose of testifying about it in this lawsuit?

A. I was not.

Q. Do you know that was not the purpose?

A. I did not know at the time, no, sir.

Q. You didn't know what the purpose was?

A. No, sir. The orders I received were to make a reconnaissance, of the New River, paying particular attention to the shoals and banks and rock ledges along there for the purpose of replenishing the store of knowledge of New River. That was signed by the Chief of Engineers. Those are the only instructions I received.

Q. You say those instructions were from the Chief of Engineers?

A. Yes, sir.

Q. Who was that?

A. It was signed by Col. Edgerton.

1619 Q. And that is the reason you made the trip up above the Narrows to Allisonia?

A. Yes, sir.

Q. You have been living at Hinton since when?

A. Since November of last year.

Q. You never made a trip from Hinton to the Narrows before?

A. Not all the way, no, sir.

Q. And of course, you never made a trip from the Narrows to Allisonia before?

A. No, sir.

Q. I meant to ask you whether I was right in understanding from Picture 27 in your exhibit 193, that this outboard motor is hinged so that it could be raised?

A. Yes, they are a hinged that way.

Q. Did you tilt it from time to time?

A. No, we did not, but upon striking an object or something like that, it would tilt to a certain extent.

Q. That is, it would hit bottom at times and then it would tilt.

A. Not that I remember, it did not hit the bottom, but it would hit a boulder probably which we could not see under the muddy waters.

Q. When you got out to pole the boat through the falls, it would tilt up then?

A. No, it wouldn't hold up in that position.

By Mr. JACKSON. I think among the maps offered by the Government, they did not include all of the maps, that were with some of these reports. I hold here in my hand a map dated November 21, 1912, reconnaissance map of New River from Hinton, West Virginia, to Radford Virginia, compiled under the direction of Major F. W. Alstaetter, Corps of Engineers, United States Army, from surveys made by the Engineering Department in 1872 and by the United States Geological Surveys, 1884-1885 and 1886, and will ask to have it marked Exhibit 527 for identification.

(Map is marked Exhibit 527 for identification.)

Q. Now I show you this exhibit marked 527 for identification, and point out to you the designation "Barnett's Falls" on the profile, and will ask you whether or not that does not show practically a sheer drop of six and six tenths feet?

A. Just a minute, I want to examine the scale. That is a very distorted scale as most profiles are plotted to, and in that case it would show almost a sheer drop.

1620 Q. You notice the figures 1693.66 and 1700.26 elevation, don't you?

A. Yes, sir.

Q. And that shows a drop of 6.6 feet. Am I right about that?

A. Yes, sir, it does.

Re-direct examination by Mr. THOMPSON:

Q. I now refer you to Exhibit marked for identification 527 by the defendant, to this reference which Mr. Jackson has made, what he calls almost a sheer drop, and ask you on that scale if that were platted as to actual distance, what that drop would cover in space, as to feet or miles?

A. That scale is distorted approximately 20 to 1 on the horizontal and two inches would equal one mile, on the vertical scale, one inch equals ten miles.

Q. So that if that were on the river, as it actually is, what stretch of the river would this so-called vertical drop, as counsel describes it, what distance would that cover on the river?

A. Mr. Thompson, I am sure there is an error here. That scale should be one inch equals ten feet instead of ten miles.

Q. Which is right, just state which is right?

A. One inch equals ten feet, instead of one inch equals ten miles, as shown on the print.

Q. And you have got how many inches there?

A. Approximately ¾ of an inch.

Q. And how much would this drop be that they speak of as a vertical drop?

A. It is still 6.6 drop, but it is spread out over a greater distance than is shown on here. If you will give me time, I can figure that out.

Q. Just take your time and do so?

A. That would be approximately 500 feet rather than a sheer drop.

Q. In other words it is a drop of that distance in a stretch of 500 feet?

1621 A. Yes, sir, that is right.

Q. Counsel for the defendant attempted to show in his cross-examination of you here that you were taking all these pictures from a distance, apparently drawing an inference that you were afraid to take them close up. Now let us look at Exhibit 192 and Picture No. 25, and I will ask you if it was possible to take that situation and that picture closer up?

A. I believe not.

Q. And that picture shows all the rocks that are in the river?

A. It does.

Q. I now refer you to the same exhibit, Wylies Falls picture. Could you have taken that any closer and showed the falls?

A. We could have, but it would not include the chute, as it is shown in there.

Q. That does show waves, doesn't it?

A. Yes, sir, it does.

Q. I now refer you to picture 19 in the same exhibit, and will ask you whether you could have taken Anderson's Falls there any closer than you did?

A. We could not have done it and included all of the falls.

Q. I show you picture No. 3 in the same exhibit and ask you if that shows rough water?

A. It does.

Q. Very rough?

A. Rather rough.

Q. Could you have taken that picture any closer; where was that taken from?

A. That was taken from the bow of the boat, about 2 feet above the water surface.

Q. How far was the water away from the camera when you took that picture?

1622 A. Well, not over 3 feet.

Q. I refer you now to Government Exhibit 193, and to the picture in the upper left hand corner, called Sifford's Falls. How far away was the camera from Sifford's Falls when you took that picture?

A. About 30 or 40 feet from the bank.

Q. And the bank was 30 or 40 feet away from the falls?

A. In that case the falls extend right to the bank line.

Q. I call your attention to picture No. 29 in the same exhibit and ask you what that is?

A. That is a view of some of the rapids that we encountered on our trip.

Q. That shows waves, doesn't it?

A. Yes, sir.

Q. How close was your camera when you took that picture?

A. Within two or three feet of the water surface.

Q. What rapids were these?

A. Just below Clark's Ferry.

Q. I show you another picture in the lower left hand corner and will ask you what that is?

A. It is a view of some more rapids.

Q. How close was your camera to the water when you took that picture?

A. Within two or three feet of the water.

Q. What did you say the distance was from Allisonia to Hinton?

A. Approximately 110 miles.

Q. And how long did it take you to come down from Allisonia to Hinton?

A. From Allisonia to the Narrows the trip took a day and a half and from the Narrows into Hinton, about nine hours.

Q. So that was two days and one-third approximately, or less than one-third, a little over two days?

A. About that.

1623 Q. Had you known the channel you could have come faster?

Objection overruled. Exception

A. We could have, yes, sir, if we had been more familiar with the channel, we could have come down quicker.

Q. Counsel for the defendant asked you about what conditions you were confronted with going upstream, and I would like to ask you whether you had a protected propeller going upstream?

A. We did not.

Q. I believe you said that the propeller was two feet deep?

A. Between two and three feet deep.

Q. And some of the shoals you went over would not draw two feet?

A. They would not.

Q. And then you had to investigate it?

A. Yes, sir.

Q. And didn't that take time?

A. It did.

Q. As I understood you in your cross-examination you said you had not had experience with the motor. Is that right?

A. That is right.

Q. Did you have any trouble in learning about the running of this motor?

A. We did have quite a bit of trouble.

Q. And did that take time?

A. It did.

Q. I believe you said you were with Mr. Gerdes when he made the test over Bulls Falls?

A. I was.

Q. And at that time you had a protected motor, didn't you?

A. Yes, sir.

Q. Did you have any trouble going over Bulls Falls, in making that test?

1624 A. None whatsoever.

Q. If the channel of this river were marked by buoys or flags, could you have made this trip faster?

A. We could have.

Q. Both going and coming?

A. Both ways.

By Mr. JACKSON:

Q. One question. When you took your pictures from your boat you took them two or three feet from the water surface in all cases, didn't you?

A. Not in all cases.

Q. When you took them from the boat you took them very close to the water, didn't you?

A. In some cases the man would be standing up in the boat and at that time he was higher.

1625 JOHN D. FITCH

Direct examination by Mr. THOMPSON:

Q. Where do you reside?

A. 35 Montgomery Avenue, Kensington, Maryland.

Q. What is your business?

A. I am an engineer in the employ of the Federal Power Com mission.

Q. What work do you do for the Federal Power Commission

A. My work has been largely in connection with power studies system load studies, investigation of potential undeveloped wate power and existing hydro electric projects.

Q. Have you read the transcript of the testimony presente before the court by Mr. Charles H. Pierce on July 23, 1936?

A. I have.

Q. Do you recall what that testimony shows as to the relativ mean daily flow as measured at the Caperton gauge on Ne River?

Q. Do you remember what the figures were?

A. I do.

By Mr. THOMPSON:

Q. I hand you, marked for identification, Government Exhibi 194, and will ask you if you know what that is?

A. That is a blueprint of the chart from the automatic record ing gauge at Caperton, West Virginia, for the period Augus 8th to August 21st, inclusive, 1930.

Q. I will ask you to look at that blueprint and state if ther is any indication of any rise along about the date, August 1 1930?

A. On August 15th this record shows a slight rise in th stage at this gauge.

Q. What did the gauge show on August 15, 1930, at the Caper ton gauge?

A. It is impossible to answer the question in tha
1626 form. The gauge is a continuous record of the stage o water.

Q. Do you know what the gauge shows on that day?

A. I can read it from this chart as to any particular hour.

Q. Give it to us as of August 15, 1930.

By the COURT. At what hour of that day?

By Mr. THOMPSON:

Q. What does that show as the lowest flow on that day Augus 15, 1930?

A. Now is that the question?

Q. Yes sir.

A. The lowest stage for that day—I would have to refer to the rating table.

Q. Just refer to that.

A. (Witness refers to said table.) It shows a stage of 1.84 feet.

Q. Do you recall what the testimony shows as the minimum flow of that day, by Mr. Pierce?

A. At which gauge?

Q. At the Caperton gauge.

A. There is no testimony as to the minimum flow at the Caperton gauge on that day, but by inference it was shown that the flow at the Caperton gauge could not have been less than a flow of 826 cubic feet per second, which was recorded on that gauge on September 10, 1930, as being the minimum flow for that water year.

Q. How much was it?

A. 826 cubic feet per second.

Q. What was the flow, if you remember the testimony, at Kanawha Falls on that same day, August 15, 1930?

A. The minimum recorded flow at Kanawha Falls on August 15, 1930, was 640 cubic feet per second.

Q. Making a difference between the two of what?

A. 186 cubic feet per second.

By the COURT:

Q. That is, if you assume that the flow at Caperton was 826?

1627 A. That is correct. It is that much or more.

Q. You say it is that much or more?

A. That is right.

By Mr. THOMPSON:

Q. Have you examined the Water Supply Paper and the United States Geological Survey in which the flows you have just mentioned, are recorded?

A. I have.

Q. State whether or not the flows as stated by Mr. Pierce in his testimony agree with those reported in the Water Supply Paper?

A. They do.

Q. From your examination of the Water Supply Papers in which are recorded the flows at those two points for the month of August, 1930, did you find where the recorded mean daily flow at Caperton exceeded the recorded mean daily flow at Kanawha Falls on the same day?

A. I did; there were six such days, in addition to August 15th.

Q. What did you find as to the relationship of the mean flow for the entire month of August 1930, at the two gauges?

A. I found that the recorded mean flow for August, 1930, at the Caperton gauge was 1450 cubic feet per second, and that the recorded mean flow for the same month at the Kanawha Falls gauge was 1520 cubic feet per second, or 5 percent greater than the flow at Caperton.

Q. State whether or not you have examined the graphs or chart showing water stages recorded by continuous recording gauges at Caperton and Kanawha Falls during August 8, 1930, to August 21, 1930, inclusive?

A. I have.

Q. How did the trend and variation of stage, as shown by the two charts, compare in general?

1628 A. The trend in variation of stage are in general conformity if one allows a lag to account for the time required for the water to flow from the upper to the lower gauging station.

Q. State whether or not there is any decided exception to this general conformity?

A. There is.

Q. When did that occur?

A. It occurred on August 15, 1930.

Q. I hand you, marked for identification, Government Exhibit 195, and will ask you to look at that and state what it is, if you know?

A. This is a chart from the recording gauge at the Kanawha Falls gauge in the Kanawha River for the period July 30th to August 24th, inclusive, 1930.

Q. Please look at that chart and state whether there is any decided change at any point shown on that chart?

A. There is a decided change shown on the chart and it occurs on August 15th.

Q. Is there any change on August 12th, 13th, or 14th of a decided nature?

A. There is no similar change, no sir.

Q. Look at the 16th and 17th, is there any decided change on those dates?

A. No change similar to that on the 15th.

Q. What kind of a change is there on the 15th?

A. The gauge record shows a fairly constant stage of minus .48 feet, from 6 a. m. to 1 p. m., at which time the stage drops off suddenly, reaching a low of minus 0.95 feet at 3:00 p. m., when it again rises and is at minus 0.48 feet again at 5 p. m., after which it continues to rise and is at minus 0.39 feet at midnight August 15th.

Q. What does the reading of that gauge indicate to you?
A. It indicates a sudden stoppage of the flow passing the Kanawha Falls gauge.
1629 Q. Do you know where the Kanawha Falls gauge and the Caperton gauge are located?
A. Yes, sir.
Q. Where is the Kanawha Falls gauge located in connection with the Electro Metallurgical Power project?
A. The gauge is located downstream from that power project.
Q. Where is the Kanawha Falls power plant of the Electro Metallurgical Corporation located with reference to the Caperton gauge and the Kanawha Falls gauge?
A. The Kanawha Falls plant of the Electro Metallurgical Company is located upstream from the Kanawha Falls gauge and downstream from the Caperton gauge.
Q. That being so, does the flow coming from the Caperton gauge pass through the Kanawha Falls plant before being recorded at the Kanawha Falls gauge?
A. It either passes through the plant or over the dam.
Q. From that what conclusion do you draw as to this particular drop as is indicated on this gauging chart?
A. From the fact there is no corresponding drop at the Caperton gauge, I conclude that the flow was re-regulated between its passing the Caperton gauge and passing the Kanawha Falls gauge.
Q. And where would that occur?
A. At the Kanawha Falls plant of the Electro Metallurgical Corporation.
Q. Is there any other hypothesis upon which you could base such a conclusion?
A. None whatever.
By WITNESS. I personally received them from one of my superiors here in Roanoke and I have seen the letters of transmittal which accompanied these gauge charts.

By Mr. THOMPSON:

Q. Does that indicate it is an original?
1630 A. This chart here indicates that it is an original, the other, of course, is a blueprint of the original.
(Exhibit 195 offered in evidence.)

Cross examination by Mr. JACKSON:

Q. Mr. Fitch, with what did you compute the lag between Caperton gauge and Kanawha Falls gauge?
A. I did it by inspection and comparing the two charts.
Q. And what is your judgment as to the variation?
A. It varied from 12 to 6 hours.

Q. Do you know what that variation depends upon?

A. Why, it is not the same at all times.

Q. Yes, but why?

A. I can see two reasons—the first is the stage of the water, whether or not it is a high or low flow, and secondly, the fact that the water may not be released from the Kanawha Falls plant simultaneously with its receipt at that plant.

Q. As the stage gets higher, does it travel faster or slower?

A. As the stage gets higher, it travels faster.

Q. How far is the Kanawha Falls power plant of the Electro-Metallurgical Company upstream from the Kanawha Falls gauge?

A. About three-quarters of a mile.

Q. Do you know what the lag is between the flow at Kanawha Falls power plant and below to the Kanawha Falls gauge?

A. No, sir.

Q. Would you think perhaps it would be 15 minutes?

A. It is hard to answer that without referring to find out whether or not the control of Kanawha Falls gauge extends closer to the Kanawha Falls plant than the location of the gauge.

Q. Referring to this Exhibit No. 195, which you have
1631 offered with dip to 640 second feet in stage corresponding to 640 second feet?

A. Yes, sir.

Q. That is substantially an instantaneous measurement?

A. The low point is instantaneous reading, yes, sir.

Q. It is an instantaneous condition?

A. Yes, sir.

Q. As a matter of fact, the elapse of time between the commencement of that dip and when the gauge rises to a point higher than it is where the dip initiated, is very short, isn't it?

A. I scaled that off and found that the rise to the same stage is approximately 4 hours for the complete cycle, from the same elevation to the same elevation again.

Q. What is the average flow for that shown by estimates?

A. The average flow at Kanawha Falls was 1070 cubic feet per second.

Q. That was an estimated flow?

A. It is estimated from the chart, of course. All reported flows in the Water Supply Papers are computed from the charts.

Q. They are all estimates made by some kind—by applying some kind of rating curve?

A. Yes, sir.

Q. Did you, in your examination of these gauge records, make any study of the twenty-one gauge reading?

A. You mean the 1921 gauge reading?

Q. Yes, sir.

A. No, sir; I limited my study to this particular case which came up in the previous testimony.

1632 Redirect examination by Mr. THOMPSON:

Q. Mr. Fitch, Mr. Jackson used the word "estimated" with respect to the discharges. Were they estimated or computed?

A. They were computed.

Recross-examination by Mr. JACKSON:

Q. You say "computed"—you simply mean that you took a rating curve and applied that rating curve to the gauge height?

A. Yes, sir.

Q. That part of it is computation?

A. Yes, sir.

Q. The rating curve itself was produced by taking a certain number of measurements and drawing a smooth curve through it?

A. Am I to testify as an expert on gauges, or from my own knowledge?

Q. What you know about it. You told Mr. Thompson something about it.

A. It is a common procedure in stream gauging work to do this.

Q. That smooth curve is drawn as a matter of judgment, is it?

A. Yes, sir.

Q. You find the measurements scattered all over the paper, some on one side and some on the other?

A. At times, I suppose, some of the series of measurements will show a better conformation to the smooth curve than others.

Q. When you find few or no measurements at either end of the curve, the curve is extended by judgment, isn't it?

A. Yes, sir; I have seen that often.

Q. You know, from your experience, that the accuracy of individual measurements plotted on the chart are themselves subject to factors of error?

A. Yes, sir; I presume so.

1633 ROGER B. MCWHORTER

Direct examination by Mr. GATCHELL:

Q. Mr. McWhorter, please state your name, your present occupation and your residence.

A. My name is Roger B. McWhorter, I am an engineer, and I reside in Washington, D. C.

Q. Are you a graduate engineer, and if so, of what college?

A. I am a graduate of the Alabama Polytechnic Institute of Auburn, Alabama, class of 1909. The University or rather the Alabama Polytechnic Institute conferred two degrees upon me—namely, Bachelor of Science in Civil Engineering, and the professional degree of civil engineer.

By Mr. JACKSON:

Q. That was in 1909?

A. In 1909 was the Bachelor of Science degree and in 1913 was the professional degree of civil engineer.

By Mr. GATCHELL:

Q. What experience have you had in your profession?

A. Before graduation I worked on the construction of the Colbert Shoals Canal, on the Tennessee River, about 30 miles down stream from Muscle Shoals.

After graduation, in June 1909, I entered the Service of the United States Engineer Department on the construction of the Hales Bar Dam, hydroelectric plant, and navigation lock, on the Tennessee River, about 33 miles down stream from Chattanooga, Tennessee. The Hales Bar water power project was one of the larger of the earlier developments and the dam created slack water navigation for a distance of about 39 miles, or to a point 6 miles above Chattanooga, and this improved the section of the Tennessee River most difficult of navigation, with the possible exception of——

By Mr. GATCHELL:

Q. Will you proceed?

A. I was on the construction at the Hales Bar project
1634 for a period of four and a half years, or until the project was completed in December 1913.

Immediately thereafter, I took charge of a survey and investigation of the Tennessee River from Hales Bar Dam, Tennessee, to the Guntersville Dam site in Alabama, for the purpose of obtaining information to formulate an improvement of the Tennessee River for slack water navigation in that 82 mile reach. The Guntersville Dam, just at the down stream end of this reach, is now under construction.

Q. What did you do after that?

A. I was on this particular work—this survey and investigation of the Tennessee River from Hales Bar to Guntersville from December 1913 to November 1914, about half that time being in the field—somewhat over half, and the remainder in the office working out the results of the survey.

From November 1914 to April 1915, I was stationed—I was in charge of the engineer depot at Chattanooga, Tennessee; in

charge of the construction of floating equipment, particularly, a dipper dredge, derrick boats, barges, dump scows and other river equipment for the improvement and maintenance of the Tennessee River.

In April 1915, I went to Muscle Shoals in charge of a survey and investigation of that particular reach of the Tennessee River which now embraces the reservoirs of the Wilson Dam and the Wheeler Dam, including surveys at the sites of these two dams, both of which have since been constructed by the United States, at the sites selected in 1915 and 1916. I was at Muscle Shoals on that preliminary work for a period of about 14 months, and, in addition to directing the field work, I collaborated with other engineers on an extended study of the power possibilities of Muscle Shoals section of the Tennessee River. The result of that survey and investigation was published in House Document No. 1210, Sixty-fourth Congress, first session.

1635 In May 1916, I accepted employment in the engineering department of the Miami Conservancy District on flood control work in the Miami River basin in southwestern Ohio. I served successively as Assistant Engineer, Assistant Division Engineer, and finally as Division Engineer, in charge of one of the principal divisions of that work. I remained with the Miami Conservancy District until the project was completed in May 1923, a period of almost 7 years exactly.

On May 1st, 1923, I accepted an appointment from the United States Engineering Department, as General Superintendent of construction at the Wilson Dam, a large hydroelectric plant or development on the Tennessee River near Florence, Alabama.

By Mr. JACKSON:

Q. That was in May 1923.

A. May 1st, 1923.

By Mr. GATCHELL:

Q. Proceed.

A. (Continuing.) The Wilson Dam is at the lower end of the Muscle Shoals reach of the Tennessee River, about 94 feet high, and backs water up to the tail water of the Wheeler Dam, which is just now being completed. I remained at the Wilson Dam as general superintendent of construction until the power plant was substantially completed in April 1925.

On April 18th, 1925, I went to Detroit, Michigan, as principal engineer assistant to the American section of the Joint Board of Engineers, appointed by the governments of the United States and Canada to make an investigation and prepare a report on the improvement of the St. Lawrence River for navigation and power. I remained with the American section of the Joint

Board of Engineers for 18 months, in charge of the preparation of project plans, both for power and navigation on the international section of the river, of the St. Lawrence River, extending from the outlet of Lake Ontario to Cornwall, Ontario, a distance of 115 miles. Various alternative schemes for the development of power in this international section of the river were prepared, detailed estimates were made, and in each case provision was made for an installation in excess of 2,000,000 horsepower.

1636 Q. Before you get to that, was that report published?

A. The report of the Joint Board of Engineers was published along about November 16th, 1926, or I believe possibly in 1927.

Q. Who published it?

A. Both Governments published it. The Canadian Government published it in full, including the appendices, and the American Government published the body of it, but put the appendices in mimeograph form.

In October 1926, I was appointed Consulting Engineer to the Orleans Levee District and the City of New Orleans to make studies and prepare tentative plans for spillways on the lower Mississippi River for the reduction of flood heights along the levees and in front of New Orleans. In that capacity, I cooperated continuously with the Federal Spillway Board, a body of engineers created by appointment of the Secretary of War, pursuant to an Act of Congress, which Board made a report to Congress on spillways for the lower Mississippi, including a recommendation for the spillways.

A. (Continuing.) On December 1st, 1928, I accepted appointment from the United States Engineer Department, as principal engineer in the second New Orleans District, on the execution of the flood control project, adopted by Congress by Act of May 15th, 1928, I remained in that position in charge of the construction of the Bonnet Carre spillway and levees throughout the Second New Orleans District, until September 1st, 1930, at which time I was transferred to Cleveland, Ohio, as principal engineer in the Great Lakes Division of the United States Engineer Department.

By Mr. GATCHELL:

Q. What did you do after leaving New Orleans?

A. I went to Cleveland, Ohio, as principal engineer of the Great Lakes Division, United States Engineer Department.

Q. What did your do—what were, in general, your duties in that position?

1637 A. My duties related to the improvement of the Great Lakes and their connecting channels for navigation and

further studies of the St. Lawrence River, with a view to its improvement for navigation and power development.

Q. After you left that position, what did you do?

A. On May 29th, 1931, I was appointed Chief Engineer of the Federal Power Commission, and I assumed the duties of that position June 27th, 1931.

Q. Are you a member of any engineering societies?

A. I am a member of the American Society of Civil Engineers and of the Society of American Military Engineers, and I am also a member of the Washington Engineering Society.

Q. Do you hold any commissions?

A. I am a Lieutenant-Colonel in the Engineer Reserve Corps, U. S. Army.

Q. What are your duties of Chief Engineer of the Federal Power Commission?

A. As Chief Engineer of the Federal Power Commission, I am in charge of the Commission's Bureau of engineering, which handles all engineering activities of the Commission.

I direct the examination of declarations of intention to construct water power projects and of applications for Preliminary permits and licenses for water power projects on navigable waters or affecting navigable waters and public lands and reservations of the United States.

Q. Have you, as chief Engineer of the Federal Power Commission, participated since coming with the Commission, in investigations of the effect of hydroelectric projects and their operation on the navigable capacity of navigable waters of the United States.

A. Yes, sir.

Q. How many such investigations have you conducted?

A. I cannot state exactly, but quite a good many.

Q. Would you say as many as one hundred?

A. I don't think that many.

1638 Q. About how many would you estimate?

A. Possibly thirty or forty.

Q. Are you familiar with the New River and the Kanawha River in Virginia and West Virginia?

A. Yes, sir.

Q. To and from what points?

A. I am familiar with New River from the mouth of Wilson Creek to the mouth of New River at its confluence with the Gauley River, a distance of 252 miles.

I am familiar with the Kanawha River from its source at the confluence of the New River and the Gauley River to its mouth at Point Pleasant, West Virginia, a distance of 97 miles.

Q. How did you acquire your familiarity with New River and Kanawha River?

A. By a study of numerous official reports, both State and Federal, and by field examinations, which I have made of the New River and Kanawha River, during the past five years.

Q. What reports have you studied?

A. First, I studied the report of the John Marshall Commission, covering the survey and expedition of that commission, made in 1812. The Marshall Commission navigated New River——

By Mr. GATCHELL:

Q. Just state by name the reports.

A. Secondly, the report of Thomas Moore, covering a survey and navigation of the New River in 1819, by himself and his associate, Issac Briggs.

By Mr. JACKSON:

Q. Is that the Moore and Briggs report that we have had reference to here?

A. Yes, sir.

By Mr. GATCHELL:

Q. What other reports have you studied?

A. The report of the Chief of Engineers for 1873, containing the report of Major W. P. Craighill, and the separate reports of Major Craighill's subordinates.

Next, I studied the report of the Chief of Engineers for 1879, containing the report of Major W. P. Craighill and
1639 separate reports of his subordinates—Captain Cuyler and and Mr. Scott, and also the report of William Proctor Smith, on his survey and investigation of New River from the Mouth of Wilson Creek to the Lead Mines.

When I mentioned the Craighill report of 1872–73, I meant also to mention the report of his subordinate, N. H. Hutton, covering Hutton's survey and investigation of New River, of the 128 mile stretch from the Lead Mines to the Mouth of the Greenbrier River.

Next after the report of the Chief of Engineers in 1879, I examined the various annual reports of the Chief of Engineers of the United States Army from 1879 to 1890, inclusive, describing navigation improvements made on the New River by the United States during that period.

Next, I examined the report of the Chief of Engineers for 1891, which contains a report by Major W. P. Craighill relating to New River.

Next, I examined the report of the Chief of Engineers for the year 1913, which contains the report of Major F. W. Altstaetter,

of a preliminary examination and report on the New River between Hinton and Radford.

Next, I examined the War Department report on the Kanawha River, West Virginia, Virginia and North Carolina, prepared and submitted to Congress pursuant to the provisions of the Rivers and Harbors Act, of January 21st, 1927; and of the Mississippi Flood Control Act of May 15th, 1928; and in accordance with House Document No. 308, Sixty-ninth Congress, first session.

By Mr. JACKSON:

Q. Is that an exhibit?

A. I think it is Government Exhibit 145; that is my recollection. This report and similar reports and various other reports on various other rivers in the country are called 308 reports, because they were made in accordance with House Document 308.

I also have examined the various official reports of the Chief of Engineers, War Department, to the Federal Power Commission, on Declarations of Intention, and applications for preliminary permits and licenses for water power projects in the Kana-

1640 wha River Basin. I have also read the transcript of each and every hearing held by the Federal Power Commission and its authorized representative on Declarations of Intention and applications for Preliminary permits and licenses for power projects in the Kanawha River basin.

1641 By Mr. GATCHELL:

Q. You told me that you had made a number of field trips over New River and Kanawha River in the past five years. What were those trips?

A. To acquire an intimate knowledge of these two streams and of the existing structures thereon.

Q. To what extent and how many times and in what places did you personally inspect New River?

A. I have made three trips over New River, from the Mouth of Wilson Creek to the mouth of Gauley River and down Kanawha River to its mouth at Point Pleansant, West Virginia.

I have made numerous other trips to different sections of the river, particularly to the Buck and Byllesby plants, above Ivanhoe—to the Radford Dam site; to the village of Radford, to Glen Lyn, to Narrows, and to the town of Gauley Bridge, the City of Charleston, and various other points on the river.

I have inspected the New River at the mouth of Wilson Creek; at the Fields Dam about two miles below the mouth of Wilson Creek; at numerous points between Fields Dam and Fries, Virginia; at the Washington Mills Dam, just above Fries; at the Buck power plant and the Byllesby power plant, several

times; at Foster's Falls; at Allisonia; at the Norfolk and Western bridge at Hiwassee; at the Radford Dam site several times, and on numerous occasions inspected stretches of the river between Radford and Point Pleasant.

Q. Have you used any ferries on the river?

A. I have; I believe I have seen most of the ferries and have crossed the river on several of them.

Q. What is the depth of water that obtains at so-called low water in the stretch of the New River between Allisonia, Virginia, and Hinton, West Virginia.

A. From Allisonia, Virginia, to Hinton, West Virginia, 111 miles, a depth of 2 feet obtains for about 98 per cent of that distance. The total distance over which the depth is less than 2 feet is less than two miles; about 1½ miles of this is at Sif-
1642 ford's Shoals, and over short distances at four other points, one of which is just above the head of Sifford's Shoals.

Q. How did you obtain the information about the depth of water at various shoals between Radford and Wyley's Falls?

A. The depth at all shoals between Radford, Virginia, and Wyley's Falls were measured recently under my direction and I personally observed the river at each and every one of these shoals. I assigned a competent engineer to this work and gave him specific instructions to go to each one of these shoals and obtain information as to the width of the navigable chute, and the depth of that chute—the minimum depth of the chute and the maximum velocity of the current in the chute.

I instructed him, in other words, to obtain information as to the most adverse condition at each one of these shoals.

Mr. GATCHELL. Your Honor, at the close of this morning's session I asked two questions which I understood your Honor to say were not permissible. I asked the witness first to state whether or not, in his opinion, New River had navigable capacity in its natural condition and then whether it was susceptible of navigation.

The COURT. My reason for sustaining the objection was because I didn't think that was a subject for expert opinion. That is what this law suit is about largely and that is what the Court has to decide.

Mr. GATCHELL. Will your Honor allow us an exception.

1643 Q. Mr. McWhorter, I show you a profile marked for identification Government Exhibit No. 196, entitled "Profile of New River, North Carolina, West Virginia and Virginia," and ask you if you recognize this chart?

A. I do.

Q. Was it prepared under your direction?

A. It was.

Q. And what does it purport to show?

A. Government Exhibit No. 196 shows a profile of New River in six sections. The section at the bottom of the sheet shows New River from its mouth up to a point 35 miles above its mouth. The next section above shows the river from mile 35 to mile 80. The third section from the bottom shows a profile of New River from mile 80 to mile 125. The fourth section up from the bottom shows a profile of New River from mile 125 to mile 170. The fifth section up from the bottom shows a profile of New River from mile 170 to mile 215. The section at the top of the sheet shows a profile of New River from mile 215 to mile 252 at the mouth of Wilson Creek.

Q. Where was the information obtained from which you had this chart prepared?

A. In order that it may be understood perhaps I had better explain first about the scales.

Q. Let me ask then as a preliminary—is this large chart on the easel exactly similar to the smaller chart introduced as Government exhibit, for identification, No. 196?

A. It is. The smaller charts are photographic reductions of the large chart, with the coloring added.

Q. Would you care to use the large chart to explain where you secured the information from which this chart was prepared?

1644 A. The horizontal scale of this profile is one inch to the mile on the large chart and probably about a third of an inch to the mile on the small one. There are two vertical scales, one showing the elevations above mean sea level and the other showing the depths. On the large chart the elevations above sea level are to a scale of twenty feet to the inch. The depths of water are shown to a scale of four feet to the inch on the large chart. The depths shown in yellow were taken from the maps prepared from the Craighill surveys of 1872, 1874 and 1878.

By Mr. JACKSON:

Q. Those dates refer to the reports in which they are published?

A. They refer to the years in which the surveys were made. I think you will find that the information is published in the reports for the fiscal year next following.

Q. You couldn't identify them by exhibits conveniently?

A. I don't know whether those particular maps are in evidence.

A. The depths shown in red represent the two foot depth below ordinary low water provided by the improvements made by the United States in the 26½ mile stretch extending up-stream from

the steamboat landing at Hinton, West Virginia, to the head of Wylie Falls, and extending from the New River bridge near Radford, Virginia, up-stream for a distance of 29¼ miles to a point about two miles up-stream from Allisonia, and shows also the eight mile section of river improved by the United States, extending up-stream from Ivanhoe Furnace for a distance of eight miles.

Mr. GATCHELL. We offer this exhibit 196 in evidence.

By the WITNESS (continuing). It will be observed at certain points along the profile no coloring appears to indicate the depths. The reason for that is that I have no information as to the depths at those places. I knew from observation and from official reports that certain depths existed there but I did not know what those depths were so I showed none.

By Mr. GATCHELL:

Q. I show you a map entitled "Railroads" and showing New River and Kanawhs River from the Ohio up to the North
1645 Carolina line, marked for identification Government Exhibit 197 and ask you if that was prepared under your direction?

A. It was.

Q. And what does it purport to show?

A. It shows the railroads as they now exist along and in the vicinity of the New and Kanawha Rivers, with the exception of numerous spur lines, short industrial tracks and spur tracks. It shows the railroads that are listed in the upper right hand corner of the exhibit.

Q. And from what sources did you secure the information from which this map was prepared?

A. The railroads were first put on this map from maps prepared by the United States Geological Survey, the various quadrangles in the New and Kanawha River valley, and from the State maps prepared by the Geological Survey. We then went to the Interstate Commerce Commission and verified all of this information and made certain that the locations of the railroads as shown on this map were correct.

Q. In the upper right hand corner the legend gives the year of acquisition and the period of construction of the several railroads shown on the map. Where did you secure that information?

A. That information was secured at the offices of the Interstate Commerce Commission.

Mr. GATCHELL. I offer Government Exhibit 197 in evidence.

Mr. JACKSON. I should like to object to it on the ground that it is immaterial and also upon the ground that the witness has

testified it is based upon information obtained at the Interstate Commerce Commission which obviously is not the best source of information. We don't even know what that is.

The COURT. Objection overruled.

Mr. JACKSON. Exception noted.

By Mr. GATCHELL:

Q. Mr. McWhorter, on Exhibit 197 is New River shown in its exact proportion?

A. No.

Q. Is it intended to be an accurate representation of the width of New River?

A. It is not.

Q. Are the locations of the railroads accurately shown?

A. They are.

Q. I show you Government Exhibit No. 198 for identification, entitled "New River, Virginia and West Virginia, Navigation Improvements between Hinton and Wilson Creek, 1877 to 1889," and ask you if that was prepared under your direction?

1646

A. It was.

Q. And what does it purport to show?

A. It shows the navigation improvements made by the United States on New River during the period from 1877 to 1890. It shows these improvements both on the map and on the profile, showing separately each of the three reaches improved by the United States.

Q. And from what sources did you obtain the information from which this map was prepared?

A. From official reports of the Chief of Engineers, War Department.

Q. And are those the official reports to which you have previously referred?

A. They are.

Mr. GATCHELL. I offer Government Exhibit 198 in evidence.

Mr. JACKSON. Do you offer that exhibit for any purpose in connection with the location of the State line?

Mr. GATCHELL. No, your Honor, we haven't attempted to offer this map for any other purpose than showing the locations of the improvements made in the river.

Mr. JACKSON. Is the same situation true with respect to Exhibit 197?

Mr. GATCHELL. Exhibit 197, the railroad map, has the same situation. It is not offered for anything except with respect to the railroads.

Mr. JACKSON. If it is offered for the purpose of showing the State line, I move to strike it out.

Mr. GATCHELL. It does not have any relevancy with respect to the State line.

Mr. JACKSON. The same is true with respect to profile map, Exhibit 196?

Mr. GATCHELL. The same is true with respect to the profile map, 196.

By Mr. GATCHELL:

Q. Mr. McWhorter, have you examined the Declaration of Intention filed by the New River Development Company, Government Exhibit No. 88, covering this Radford project and assigned to the Appalachian Electric Power Company on August 30, 1926, as shown in Government Exhibit 89?

A. I have.

Q. Will you describe the project which the Appalachian Electric Power Company proposes to construct under this declaration?

A. The Appalachian Electric Power Company proposed to construct a water power development on the New River about seven miles above Radford, Virginia, and about one mile above the mouth of Little River. The dam was to be of sufficient height to create a maximum power head of about 110 feet and a reservoir extending up-stream to the vicinity of the railroad
1647 bridge at Hiawassa.

By Mr. JACKSON:

Q. Is this the Declaration you are talking about?

A. Yes. The surface area of the reservoir at elevation 1840, which was to be the maximum normal level of the reservoir, was stated to be 4000 acres and the usable storage in a draw-down of ten feet was stated to be 40,000 acre feet. The declarant proposed to install 60,000 kilowatts in four units of 15,000 kilowatts each. The power house and sub-station were to be on the right side of the river, looking down-stream, of course.

By Mr. GATCHELL:

Q. Have you examined the Application for License filed September 4, 1926?

A. I have.

Q. Is the project which was proposed to be constructed under that application as shown by the maps and plans filed with the Application for License, the same as that proposed for construction under the Declaration of Intention?

Mr. JACKSON. May I ask if that is an exhibit?

Mr. GATCHELL:

That is Government Exhibit 90–A.

A. The project covered by the Application for License filed September 4, 1926, was substantially the same as that covered by the Declaration of Intention No. 86, filed by the New River Development Company, but the Appalachian Electric Power Company, by letter dated October 16, 1930, filed amended maps making substantial changes in the project and thus amending their application before the Federal Power Commission for a license for the project.

Q. Have they made any further amendment of this application since October, 1930?

A. They have not, and, to the best of my knowledge and belief, the company now proposes to build the project in accordance with those amended plans filed in October, 1930, and
1648 as set forth in the Bill of Complaint and Answer in this proceeding.

Q. Have you seen any topographic maps of the reservoir area of this proposed reservoir?

A. None except the topographic maps of the United States Geological Survey.

By Mr. GATCHELL:

Q. Will you describe the project as shown on the revised plans?

A. The dam is to be located, according to the revised plans, in and across New River at a point a little more than one-half mile above the mouth of Little River. The dam will be about 130 feet high above rock foundation, it will be about 1100 feet long and will create a reservoir about 21½ miles long with a total or gross storage in excess of 200,000 acre feet, and utilizable storage, in a draw-down of 27 feet, of about 100,000 acre feet. The power house will be constructed integrally with the dam on the right side of the river and will have an installation of 104,000 horsepower in four units of 26,000 horsepower each. The transmission line to which the power from this plant will be delivered is on the right bank of the river and can be reached in a distance of about 800 feet southerly from the power plant.

By the COURT:

Q. What were the substantial changes in the plans made in the amendment filed in 1930 over the original plan submitted in 1926?

A. The more substantial changes were the re-location of the dam at a point about half a mile down-stream, the increase in the height of the dam to elevation 1846 instead of 1840, the increase in the installation from 80,000 horsepower to 104,000 horse-

power, and the change of the type of the dam from an over-fall dam with a spill-way section on the left side of the river, to a dam with gates continuously across the stream from the end
1649 of the power house to the left bank of the river.

Q. You refer to a spillway; what does that term mean?

A. That is the provision made for passing excess waters.

Q. Through the dam?

A. Over the dam—flood waters.

By Mr. GATCHELL:

Q. The spillway is located on the crest of the dam?

A. The concrete dam constitutes the spillway, there being a number of sections of spillway between piers, a gate between two piers, all the way across the river.

Q. That is a series of gates?

A. A series of gates surmounting the spillway and which, in turn, are surmounted by the operating bridge from which the gates are lifted. The gates in this project are vertical lift gates 27½ feet high.

Q. And do you know the opening underneath the gates when raised?

A. 27½ feet. The crest of the masonry spillway is at elevation 1818½. The maximum level of the reservoir is at 1846 or 27½ feet higher, and when the gates are lifted they can be lifted high enough to get above that maximum elevation of the pool at least five feet, and leave the spillway clear to discharge the greatest possible floods.

Q. Was there any change in the storage capacity?

A. The storage capacity was substantially increased, principally by reason of the fact that the surface of the reservoir was raised six feet and, to a lesser extent, due to the fact that the dam was moved a short distance down-stream.

Q. And was there any difference in the utilizable storage?

A. Yes, there was a very substantial difference in the utilizable storage. The Declaration of Intention declared that in a draw-down of ten feet the project would provide utilizable storage of 40,000 acre feet. Of course, they could have arranged
1650 for a greater draw-down and a greater utilizable capacity but they did not and, under the Application for License as amended, they provide for a draw-down of 27 feet, about, and for utilizable storage of 100,000 acre feet.

Q. Has the construction of this project proceeded to such a stage that it would be impossible to provide for an additional draw-down beyond the 27 feet set forth in the plans?

A. No.

Q. You gave the discharge of water required to operate this plant at its greatest capacity at 104,000 horsepower?

A. I don't believe I did.

Q. Will you give us that?

A. The discharge necessary to operate this installation of 104,000 horsepower at a net head of 110 feet and at gate opening of best efficiency would be approximately 9000 cubic feet per second—perhaps just a little more. At higher heads and greater gate openings the amount of water could be greater than 9000 second feet, ranging up to 10,000 or perhaps a little higher.

Q. When would that maximum hydraulic capacity of the turbines be reached?

A. The extreme maximum hydraulic capacity would obtain at the maximum head of 116 feet and full gate opening.

Q. And under what conditions of stream flow would the maximum discharge occur through these turbines?

A. It would occur at any time the entire installations were operated to capacity.

Q. Would this Radford power plant operate independently, or as a part of a power system?

A. The Radford project is being constructed to operate as a part of the power system of the Appalachian Electric Power Company.

Q. Do you know the names and capacities of the steam-electric and hydro-electric plants in that system?

1651 A. I do.

Q. Will you give them to us?

A. The steam-electric plants included in the Appalachian Electric Power Company's system are: The Cabin Creek, West Virginia plant, with an installed capacity of 116,000 KW. The Glen Lyn plant—these are all steam plants—with an installed capacity of 80,000 KW. The Logan, West Virginia, plant with an installed capacity of 44,000 KW. The Kenova, West Virginia, plant with a capacity of 40,000 KW. That is near Huntington, West Virginia. The Hazard, Kentucky, plant with an installation of 19,500 KW. The Roanoke, Virginia, plant with an installation of 13,750 KW. The Kingsport, Tennessee, plant with an installation of 10,000 KW. There is a plant in Charleston, West Virginia, that has an installed capacity of 7,750 KW but it is my understanding that plant has been laid aside.

Q. Did you say 7,700?

A. 7,750. That plant is no longer in operation, as a part of the system, if I understand correctly.

The total of those seven steam plants, the total installation, is 323,000 KW.

By Mr. JACKSON. Omitting the last one?

By the WITNESS. Omitting the Charleston plant.

A. (Continuing.) The Appalachian Electric Power Company has four hydroelectric plants, to my knowledge. These being: The Byllesby, Virginia, plant with an installation of 21,600 KW. The Buck, Virginia, plant on New River, as is the Byllesby plant, with an installation of 7,740 KW. The Reusens plant on the James River, near Lynchburg, Virginia, with an installation of 12,560 KW. The Niagara plant, on the Roanoke River near this city, with an installation of 2,760 KW.

The total installation for those four plants being about 45,000 KW.

1652 The Kanawha Valley Power Company, an affiliate of the Appalachian Electric Power Company, has two hydroelectric plants on the Kanawha River, at the Marmet and London navigation dams. These two plants have an installation of about 15,000 KW each.

The Kanawha Valley Power Company now has under construction a 20,000 KW hydroelectric plant at the Winfield navigation dam, about thirty-six miles downstream from Marmet, and as I understand, the Appalachian Electric Power Company is now constructing a 40,000 KW steam-electric extension to its Logan, West Virginia, plant.

Q. Are the company's existing hydroelectric plants run of the river or storage plants?

A. The company reports them all as being run of river plants. They are not, however, strictly run of river plants, since some of them, at least the Byllesby and Buck plants, operate on a variable load, causing wide fluctuations in the flow of the river below them. Their reservoirs are small and provide only pondage for daily and possibly a little weekly regulation, and they are of the class that are usually and commonly referred to as run of river plants.

Q. Now would this Radford project be a run of the river project or a storage project?

A. It would be a storage type project.

By the COURT. What is a run of the river plant?

By the WITNESS. Strictly speaking, sir, they would pass the water exactly as it comes, as fast, but no faster than it comes.

Q. That is, they would not hold back the water when they had plenty to use later when the supply was low?

A. They would not impound any water at all, except that necessary to fill the ponds when they are first constructed.

1653 Q. Will the Radford project be a run of the river project or storage project?

A. It will be a storage project.

Q. What is the usual, customary, and economical manner of operating such a storage project?

A. The usual manner of operating a project like the Radford project in a utility system, in an electric system, having a general utility load, is to operate the hydroelectric project having storage on the peak of the power load. Ability to so operate is one of the principal advantages of a project of this type; unless such a project could operate in that manner in a great number of cases most of them would be economically infeasible.

Q. Would this Radford project be economically feasible if it was not operated as a peak load plant?

A. It would not. It would not be constructed unless it were to be, or could be operated for carrying peak loads. It would not be economically feasible on any other basis.

Q. I show you a chart, marked for Identification Gov-
1654 ernment's Exhibit #199, entitled "Load curve of the Appalachian Electric Power Company, for the week ending November 3, 1935," and ask you if that was prepared under your direction?

A. It was.

Q. What does it purport to show?

A. It shows the power load, load of the system for the week ended November 3, 1935, and is typical of power systems having a general utility load. The curve has sharp peaks and shows that during certain hours of the day the load was much greater than the minimum load or the average load.

Q. In what manner could the Radford Project be advantageously and economically operated in connection with a load of this kind?

A. The Radford project could be operated on the peak of the load; that is, so as to carry a part of the load during the hours of the day when the load is greatest; operated during periods of relatively short time duration; by which I mean the project, that the installation would be operating a part of each day, and would be closed down a part of each day, and that the installation would be closed down or at least not generating over week ends, for periods of two or three days at a time, two days usually and three days when holidays happened to fall on Fridays or Mondays. Also, that during periods of extremely low flow or even periods of moderate flow, the plant might be closed down for periods longer than three days.

Q. Is this the economical, customary manner of operating a plant of this kind, under similar circumstances?

A. It is.

By Mr. JACKSON. We move to strike out the answer. There is no proof the witness ever operated a power system in his life.

By Mr. GATCHELL. He is the Chief Engineer of the Federal Power Commission, in charge of utility systems throughout the country.

By the COURT. He may answer.

By Mr. JACKSON. Exception.

A. It is. Hydroelectric plants of this type are invariably operated to carry peak loads. That is, I believe, universally true, but certainly true in a power system like the system of the Appalachian Electric Power Company.

The system of the Appalachian Electric Power Company is essentially a steam-electric system, and a hydroelectric project of this particular type will be extremely valuable on that system. A few years hence it will be greatly more valuable than it would be if it were completed today. The reason for that is that this system load is certain to grow, and as it grows these peaks will become more elongated.

1655 To illustrate that, the twenty-four hours of the day will, of course, remain the same, but the peak, the part of the load above the base load, will grow higher. That is, more kilowatts measured in heights along the kilowatt scale; therefore, the peaks will be sharper, and a project like the Radford project will be more valuable in the system.

Q. By that do you mean they are constructing this plant for their future requirements?

A. Absolutely.

By Mr. JACKSON. I object to that. He can't possibly answer the question.

A. (Continuing.) They would not need this project in their system with the installation they have now—they would not need it—and I see no reason why they would be constructing it unless they were looking to the future. I don't mean by that that if this project were constructed they wouldn't utilize its output, for they would; they would simply shut down steam plants and utilize this output.

Q. Would the operation of this project in the manner you have described affect or in any way modify the natural flow of New River?

A. It would. The operation of this project would cause great fluctuations in the flow of the stream below the dam and power house.

Q. Will you tell us how the economical operation of this plant in connection with the load curve of this system would affect the discharge through the Radford plant, in your opinion?

A. The Radford project, by reason of its storage, is ideally adapted to operate carrying peak loads. That means, of course, a variable operation, ranging from no load at all for part of the

day to the maximum load that can be carried for part of the day, varying loads for part of the day, which method of operation would cause fluctuations in discharge below the dam ranging from zero flow to the hydraulic capacity of the installation, which would be at least 9000 cubic feet per second.

1656

Q. What phase of the usual method of operating such a storage project would cause the most serious or adverse effects on the flow of the rivers below Radford?

By Mr. JACKSON. I object to the form of the question, because I don't think it is intelligible.

By the COURT. He means what is it, in the operation of the plant, that will cause the most serious disadvantage.

By Mr. JACKSON. The question I had in mind—I didn't understand what disadvantage.

By the COURT. He wants him to point out the most serious disadvantage.

By Mr. JACKSON. He might point out a field he knows nothing about. I think the question should point out to what field he is to direct his answer.

By the COURT. He may answer.

By Mr. JACKSON. Exception.

A. The complete shutting off of the flow of the river at the Radford dam would cause the most serious, adverse effect on the flow of the New River, Kanawha and Ohio Rivers, below the Radford dam. The shutting off of the flow [interrupted].

By Mr. JACKSON. I move to strike out the statement—that the flow of the Kanawha and Ohio would be affected, there is no proof he has any competency to pass on that. It has been gone into by other witnesses.

By the COURT. Overruled.

By Mr. JACKSON. Exception.

A. (Continuing.) The shutting off of the flow for two or three days at a time, or for longer periods, would cause the most adverse effects.

Q. Between what limits would it be reasonable to expect the flow of the river just below the dam to fluctuate as a result of operating the power plant?

A. The flow of the river just below the dam will vary from zero flow to 9,000 second-feet flow as a result of the operation of the power plant.

Q. Will you just tell us, in your opinion, during what periods of time the Radford reservoir would be shut down if they operated this project in the most economical manner?

A. It would be the rule, and not the exception, that this plant would be shut down over week ends, during periods of low and moderate flow of water. At all times when the flow of the river

is in excess of the hydraulic capacity of the installation, and when the reservoir is full, this plant would operate continuously; otherwise, it would be an economic waste, because the water would run to waste, but at times when the flow is low, or when a moderate flow prevails, the plant would, as a rule, be shut down over the week ends, and it might be shut down for longer periods, and doubtless would be.

Q. Will you state, if you know, what would be the effect
1657 of such a shut down on the navigable capacity of New River?

By Mr. JACKSON. I object to the question, because it assumes New River has a navigable capacity.

By the COURT. He may answer.

By Mr. JACKSON. Exception.

A. The shutting off of the water at the Radford dam and impounding of the water in the Radford reservoir, would render navigation impossible on the New River, because the river would no longer have depths sufficient to carry any kind of craft.

Q. What would be the effect on the navigable capacity of the Kanawha River, in your opinion?

A. With the Kanawha River in its present condition, the shutting off of water at the Radford dam for periods of two or three days at a time, or for longer, would render navigation impossible between the Marmet dam, about ten miles above Charleston, West Virginia, and wicket dam #11 down near the mouth of the Kanawha River, because the pools behind the wicket dams could not possibly be maintained in times of extreme low water. I mean I desire the record to show that my testimony is, that navigation would be impossible on the Kanawha River in the reach I mention, during extreme low flow periods, if water should be impounded in the Radford reservoir over week ends.

Q. What effect would the impounding of the entire flow at the Radford project have upon navigable depths in the Kanawha River after completion of the Gallipolis and Winfield dams?

A. The impounding of the entire flow of New River for periods of two or three days or for longer periods at Radford, would reduce the navigable depths in the upper ends of the several navigation pools, and would increase the cost of operation of the navigation dams, increase the cost to the United States for operation of the navigation dams.

Q. Those are the new dams you are talking about.

A. Yes, sir; that is right.

By Mr. GATCHELL:

Q. Just how would it increase the cost of operating the dams on the Kanawha River?

A. The pools provided by these dams on the Kanawha River and by the Gallipolis dam on the Ohio River are at fixed levels with the exception of the London Pool which has a small
1658 amount of pondage, with draw-down of three feet from elevation 614 to elevation 611. To maintain these pools at their normal level under varying flows, requires their almost constant manipulation, raising, and lowering, so as to maintain the pools at the project level.

Q. Are you talking about the London and Marmet?

A. Marmet, Winfield, and Gallipolis, and London under certain conditions.

Q. Is there going to be any power installation at the Gallipolis Dam?

A. It is possible, but no application has been filed for an installation at that site with the Federal Power Commission.

Q. Is there any provision by the Government for that?

A. No, sir.

By Mr. GATCHELL:

Q. Can you give me the elevations of the four pools, London, Marmet, and Winfield and Gallipolis?

A. I think I can give them to you from memory, but I have them in a letter here and maybe I had better refer to that.

By Mr. JACKSON:

Q. A letter from whom?

A. From the Acting Chief of Engineers, General George B. Pillsbury.

By WITNESS. The normal pool elevations are as follows: London, 614; Marmet, 590;—these are elevations above mean sea level—Winfield, 566; and Gallipolis, 538, all of which elevations are referred to the Sandy Hook datum. These are the normal pool elevations except at London where at times a three-foot draw-down may be permitted, subject, of course, to the paramount requirements of navigation.

By Mr. JACKSON:

Q. Are you reading from a letter now?

A. I read the last sentence from a letter to show that 614 was not the level for London, corresponding strictly to the levels I gave for Gallipolis, Winfield, and Marmet.

1659 By Mr. GATCHELL:

Q. What effect would the impounding of water at the Radford dam have upon the navigable capacities of the Ohio, below the mouth of the Kanawha, during the low water periods, in the Ohio?

By Mr. JACKSON. We object to the question unless it is more definite—impounding for what purpose—time and manner?

By Mr. GATCHELL:

Q. What effect would the shut off of water at the Radford project for periods of two or three days, or longer, have?

By Mr. JACKSON. We object further for the reason there is no issue in the pleadings with reference to the Ohio River.

(Objection overruled. Defendant excepts.)

A. The discharge of the Ohio River immediately above the mouth of the Kanawha River sometimes falls below 1,650 cubic feet per second. Between Pittsburgh and the mouth of the Kanawha River, are a large number of navigation dams, all of which are strictly navigation dams, and and the exigencies of operation of these navigation dams, all of which are operated in the interest of navigation, are such that the flow of the river immediately above the mouth of Kanawha sometimes falls very materially below what otherwise would be the natural flow of the river at that point, in fact I am thoroughly convinced that the flow of the Ohio River above the mouth of Kanawha at times falls below 1,000 cubic feet per second. The navigation dams on the Ohio River, below the mouth of Kanawha, are of the wicket type, that is, all of them at present are of the wicket type, and all of them, so far as we know and can foresee, will remain to be of that type, except Gallipolis dam, which will be of the same type as the Winfield, Marmet, and London dams, the only difference being that the Gallipolis dam is a larger dam.

Now in times of critical low water in the Ohio River, the army engineers have great difficulty in maintaining navigation in an effective way on the Ohio River, due to the difficulties of maintaining pools above these wicket dams.

By Mr. JACKSON. I move to strike out the statement as to what difficulties the army engineers experienced as being purely hearsay.

By the COURT:

Q. Do you have knowledge of that yourself?

A. I certainly do, Your Honor.

By Mr. JACKSON:

Q. Have you charge of operating these dams or have you ever operated these dams?

A. I never have operated any of these dams; no.

Q. And you never had charge of that District?

A. No; but I have been familiar with these dams for twenty years, with their design and method of operation, for twenty years.

1660 Q. All you know about the operation is what has been told you about it, at best?

A. It is notoriously known that they had difficulty there, I mean, it is notoriously known among persons who would be expected to have that information.

By Mr. JACKSON. I renew my motion to strike out the statement.

By the COURT. I might sustain it but it has already been testified to by people who did have actual connection with it out there, and they have stated the effect or the difficulties of navigators along the river. That has already been testified to.

By Mr. JACKSON. I do not think they have testified as to the difficulties that engineers have had in regard to the pool.

By the COURT. Go ahead.

By Mr. JACKSON. I desire to except.

A. In times of extreme low water in the Ohio River, which is the criterion in what we are now talking about, the Ohio River below Kanawha River, needs every second-foot of water the Kanawha River can supply, and needs more.

Q. What would be the situation with respect to that after the Gallipolis dam is completed?

A. The Gallipolis dam will have a fixed pool and variations in discharge will be transmitted through that pool and they will continue just the same on down the river below the Gallipolis dam.

Q. Do you have in mind any particular periods in the past when the shutting off of the flow at the Radford dam would have adversely affected the navigable capacity of the Ohio?

By Mr. JACKSON. May it be understood that all of this evidence is subject to our objection, that it is not within the issues in the pleadings and not within the experience and competency of this witness.

By the COURT. Yes.

By Mr. GATCHELL. Go ahead.

A. I have in mind particularly the ten-day period in 1932, and the eight-day period in 1918. I could give any number of other instances when navigation on the Ohio River would be seriously embarrassed by impounding the water of the entire flow of the river at Radford for two or three days at a time. I will have to refer to my notes to get those figures.

During the ten-day period from September 15 to September 24, inclusive, 1932, the mean flow of the Kanawha River at its mouth was 1,210 cubic feet per second, and the mean flow of the Ohio River just above the mouth of the Kanawha River was 1,770 cubic feet per second. The combined flow at the confluence of the two streams was approximately 3,000 cubic feet per sec-

ond, and the Kanawha contributed 40 percent of this combined flow.

Of the 1,210 cubic feet per second contributed by the Kanawha River, approximately 700 cubic feet per second came from above the Radford dam site. The withholding of that 700 cubic feet per second in the Radford reservoir would greatly increase
1661 the difficulties of maintaining navigable depth above the wicket dams in the Ohio River, and consequently increase the cost to the United States of Caulking the wicket dams. Any number of similar instances could be shown.

For instance, during the eight-day period from August 24 to August 31, 1918, the Kanawha River contributed more than three-fourths of the water that flowed in the Ohio immediately below the mouth of Kanawha River.

By Mr. JACKSON:

Q. Is that your own memorandum you are using there?

A. That is my own memorandum that I am reading from but these Ohio river figures that I gave were obtained from the army engineer at Cincinnati.

Q. Mr. McWhorter, there was some doubt as to the elevation of the pool above London Dam. I show you Government Exhibit 199, being the license issued to the Kanawha Valley Power Company for project 1175 and will ask you to read article 16 of that license.

A. Article 16 is as follows: "It is hereby understood and agreed that the United States specifically retains and safeguards the right to use water in such amount to be determined by the Secretary of War as may be necessary for the purposes of navigation. The operations of the licensee, so far as they affect the use and discharge of the water, and the regulation of the elevation of all pools shall be controlled at all times by the Division Engineer, War Department, in charge of the improvement of Kanawha River, pursuant to such reasonable rules and regulations as may be made from time to time by the Secretary of War in order to prevent any impairment of navigability. Subject to the foregoing paramount conditions, the licensee shall so operate power stations and utilize pondage of the London pool between elevation 614 and 611, that it will make the most efficient use of the water power potentially available."

By Mr. GATCHELL:

Q. If the London pool should be operated so as to elimi-
1662 nate the three-foot draw-down would any variation in flow above the pool be transmitted through the London pool?

By Mr. GATCHELL:

Q. Answer the question.

A. If the London pool should be maintained at its maximum level at elevation 614 feet above sea level, variations in discharge would be transmitted rapidly through the pool and in full effect.

By Mr. GATCHELL:

Q. Mr. McWhorter, I believe you stated before recess that you were familiar with the plans for the proposed Bluestone project. Is that correct?

A. I am.

Q. If the Bluestone project were to be constructed as proposed, what affect would the shutting off of water at the Radford dam during low flow periods have upon the navigable depth in the New, Kanawha and Ohio Rivers below Bluestone?

A. The Radford project has sufficient storage capacity to impound the entire flow of the stream during periods of low water for many days at a time. It has sufficient capacity to impound the entire flow during two months like September and October 1930.

The Bluestone reservoir has been designed to regulate the flow of New River during a dry period like 1930, so that the flow immediately below the dam will at no time fall below 2,000 cubic feet per second. This regulated flow compares with the natural extreme low flow of somewhat less than 700 cubic feet per second.

In a long dry season such as occurred during the period from June to November 1930, the Bluestone storage would at some time during that period, probably towards the latter end of the period, be approaching exhaustion.

By Mr. JACKSON:

Q. 1930, you are talking about?

A. Like the summer and fall of 1930.

Now, if at that time, the Radford project should be storing water it would be impossible for the Bluestone project to maintain a minimum flow of 2,000 cubic feet per second throughout the season, and as a result navigation on the New, Kanawha and Ohio Rivers, would suffer by reason of the fact that those
1663 streams would not have the regulated flow, which otherwise would obtain from the Bluestone project.

Moreover, such shutting off of the water would reduce the prime power at the Bluestone project, and in that way affect the Government's investment in the project.

Q. In what way would it affect the Government's investment in the Bluestone project?

(Defendant objects to any testimony that is designed to show damage to the Government's investment.)

Q. Will you answer the question?

A. May I have the question read.

(Question read.)

A. The Government's investment in the Bluestone project would be jeopardized to the extent that the prime power at Bluestone is reduced.

Q. And does the prime power that the Bluestone project may produce have any relevancy to the value of the power from that plant?

A. Absolutely.

Q. Now, if the Bluestone reservoir should discharge a minimum flow of 2,000 second feet or more, would that increase the flow on the Kanawha River?

A. Yes; it would very substantially increase the extreme low water flow on the Kanawha River, it would very greatly increase any extreme low water flow on the Kanawha and also greatly increase any extreme low water flow on the Ohio River.

Q. And would that benefit the power projects on the Kanawha River?

A. It would. It would be a very substantial benefit to the Marmet, London, and Winfield power projects, and also to the project at Kanawha Falls of the Electro Metallurgical Company, and to the project at Hawks Nest of the Electro Metallurgical Company.

Q. And how would that benefit be evidenced?

A. By increasing the reliable power available at these plants, that is, reliable to the extent it would be reliable, and to a greater extent than it is now reliable at Marmet, London, and Winfield.

1664 Q. Is primary power more valuable than secondary power from a generating station?

By Mr. JACKSON. Of course it is understood that our objection applies to all of this evidence.

By the COURT. Yes.

A. Yes; it is very much more valuable.

By Mr. GATCHELL:

Q. What do you mean by primary power?

A. Power that is dependable continuously.

Q. For how long a period of time?

A. Continuously throughout the day, throughout the week, and throughout the year, and year after year.

Q. For 100 percent of the time?

A. Yes, sir.

Q. What is meant by secondary power?

A. Power that is available only part of the time. There are various grades of secondary power, high grade, low grade, and very low grade, called dump power, some secondary power that is available for say nine or ten months in the year.

Q. And does the time at which the power will be available affect its value?

A. Yes. If at certain times it will not be available that would certainly very radically affect its value.

Q. If there was a demand and it was not available, it would affect the value of it?

A. Under those conditions no one could be expected to pay much for it. What they would pay for would be dependable power.

Q. Would the Radford project ameliorate or aggravate flood conditions in the New, Kanawha, and Ohio Rivers?

By Mr. JACKSON. May we have an exception noted to all of this testimony as irrelevant?

By the COURT. On the grounds you have already stated?

By Mr. JACKSON. Yes.

By the COURT. I will overrule the objection.

(Defendant excepts.)

A. The Radford project by reason of the fact that its reservoir occupies valley storage, which otherwise would be available for the temporary storage of flood waters, would tend to increase flood heights below the dam

I make that statement on the assumption that before the largest flood flows arrive at the head of Radford reservoir, the flow at the plant would be in excess of the hydraulic capacity of
the plant, and usually the reservoir would be full or
1665 nearly full. If full, the results could not possibly be other than to increase flood heights below the dam, increase flood heights in the New, Kanawha, and in the Ohio Rivers, and would place an increased flood height or flood liability on the Bluestone project.

Q. Assuming the reservoir at Radford to be drawn down in anticipation of a flood, what would be the effect when a flood came along?

A. Under the conditions you have stated, the effect of the Radford reservoir would be to reduce flood height below the Radford dam. Such operation might, however, increase the flood heights down in the vicinity of Charleston, by synchronizing with flood flows from the lower tributaries.

Q. Are you familiar with the provisions of a license issued on October 25, 1932, by the Corporation Commission of Virginia to

the Appalachian Electric Power Company for the construction, maintenance, and operation of this Radford dam?

A. I am.

Q. Does the State license provide for a minimum release of water from the Radford reservoir?

By Mr. GATCHELL:

Q. I show you Government Exhibit 156, in the back part of which appears an order granting a license dated at Richmond, October 25, 1932, Case No. 4991, and ask you if that is the license to which you have reference?

A. It is.

By Mr. GATCHELL:

Q. Will you refer to paragraph 3 of that order appearing on page 233 of Government Exhibit 156, and tell me what discharges are required to be passed by the Radford project?

A. Paragraph 3 on page 233 of Government's Exhibit 156, reads as follows:

"3. That the construction and operation of the proposed dam and power station shall be such as at all times to prevent all unreasonable interference with the stream flow and at all times to minimize, as far as practicable and consistent with the reasonable use of the stream, interference, obstruction, and impair-
1666 ment of the stream flow, and the licensee shall, unless a smaller quantity be hereafter authorized by this Commission, discharge not less than twenty-five cubic feet of water per second and not less than a total of 50,000,000 gallons of water in each twenty-four-hour period, and not less than a total of 1,000,000,000 gallons of water in each weekly period, provided that whenever and so long as the amount of the water in New River immediately below the mouth of Little River shall be at least as much as would be produced at such point by the release at the dam of twenty-five cubic feet per second and not less than a total of 50,000,000 gallons of water in each twenty-four-hour period, and not less than a total of 1,000,000,000 gallons of water in each weekly period, if there were no other source of supply, the licensee hereunder shall be relieved of the obligation and duty of releasing or discharging any water, or any more than a sufficient quantity to constitute the minimum flow below the mouth of Little River, that would be produced at the same point by a discharge of twenty-five cubic feet per second and not less than a total of 50,000,000 gallons of water in each twenty-four-hour period, and not less than a total of 1,000,000,000 gallons of water in each weekly period at the dam if there were no other source of supply at all at the particular time;"

Q. Mr. McWhorter, does the flow of Little River ever fall below 25 CFS?

A. It never has.

Q. What is the equivalent of 50 million gallons per 24-hour period in cubic feet per second, mean flow?

A. Approximately 77 cubic feet per second; to be exact 77.36 cubic feet per second.

Q. Has the flow of Little River ever fallen below that?

A. Yes, sir.

Q. What is the equivalent of One Billion gallons per week expressed in cubic feet per second, mean flow, for a week?

A. It is 221 cubic feet per second.

1667 Q. Did you hear the testimony of Mr. C. H. Pierce regarding the flow of Little River?

A. Yes, sir.

Q. Do you know what the flow of Little River would be—do you know what the flow of Little River has been?

By Mr. JACKSON:

Q. When?

A. The flow of Little River, recorded a minimum of 50 cubic feet per second at the Graysonton gage a few miles above the mouth of the river in 1932. The estimated flow at the mouth, on the basis of proportional drainage areas, would be about 56 cubic feet per second, mean flow that day; this 50 cubic feet per second was mean flow for one day.

The maximum flow of Little River at its mouth is not known; that is, not to my knowledge; it never was determined to my knowledge.

The flow of Little River, the average flow of Little River based on past records, is 401 cubic feet per second as testified by Mr. Pierce.

By Mr. GATCHELL:

Q. Have you made an independent investigation of the flow of Little River, since you have been Chief of Engineers of the Federal Power Commission?

A. Yes, sir. About three years ago, I computed—I estimated the mean flow of Little River from past records—no; I did not estimate—I did not estimate the average flow of Little River. I prepared a flow duration curve of Little River, from which the flow of 77 cubic feet per second was shown to be available for 99.3 percent of the time. My flow duration curve showed that 221 cubic feet per second would be available 73.6 percent of the time.

1668 By Mr. GATCHELL:

Q. Mr. McWhorter, have you compared the average discharge of the New River and the average discharge of the Gauley River, as shown by stream flow records, over a long period of years?

A. I have.

Q. And what does that comparison show?

A. (Producing papers.) It shows—first I will state the results found for the sixth months period, June to November, 1914: The mean flow of New River at its mouth for this six months period, was approximately 2480 cubic feet per second, and the mean flow of the Gauley River at its mouth for the same period was about 260 cubic feet per second.

Q. What per cent came from above the Radford dam site, Mr. McWhorter?

A. Sixty per cent of the New River discharge at its mouth came from above the Radford dam site, during the period—the six months period from June to November, inclusive, 1914.

Next I considered the six months period from June to November, inclusive, 1930. During this period, the mean flow of the New River at its mouth, was about 1480 cubic feet per second, and the mean flow of the Gauley River at its mouth was 50 cubic feet per second. Approximately 97 per cent of the combined flow of the two streams was contributed by the New River and 65 per cent of the New River contribution came from above the Radford dam site.

Next I considered the three months period of June, July and August, 1911. During these three months—this three month period—the mean flow of the New River at its mouth was about 2820 cubic feet per second, and the corresponding flow of the Gauley River at its mouth was 312 cubic feet per second. The New River contributed 90 percent of the combined flow of the two streams, and 55.3 per cent of the New River contribution came from above the Radford dam site.

The next month was September, 1932, during which the mean
1669 flow of the New River at its mouth was 1270—about 1270 cubic feet per second, and the mean flow of the Gauley at its mouth was 100 cubic feet per second. New River contributed 92.9 percent of the combined flows of the two streams and about 71 percent of the New River contribution came from above the Radford dam site.

Next I considered the month of September, 1934, for which the mean flow of New River at its mouth was about 3,690 cubic feet per second, and the mean flow of the Gauley River at its

mouth was 390 cubic feet per second, New River contributed 90½ percent of the combined flow of the two streams during that month, and about 62 per cent of the New River contribution came from above the Radford dam site.

By Mr. GATCHELL:

Q. Have you looked at the month of October, 1930? Or did you look at it?

A. Yes, sir. During the month of October, 1930, the mean flow of the New River—I mean, during the month of October, 1930, the mean flow of the Kanawha River at the Kanawha Falls gage, was 1,130 cubic feet per second and only seven (7) second-feet of that flow came from the Gauley River, the remaining 1123 cubic feet per second being contributed by the New River.

Q. What are the respective drainage areas at the Kanawha Falls gage and at the Radford dam site?

A. The drainage area at Kanawha Falls gage is 8367 square miles and at the Radford dam site 2382 square miles.

Q. And what is the drainage area between these two points?

A. It is 5,985 square miles.

Q. What percentage of the drainage area at the Kanawha Falls gage lies above the Radford dam site?

A. 28½ percent of the drainage area above Kanawha Falls gage lies above the Radford dam site.

Q. Now, during the dry periods, which is more productive of run-off—the drainage area above the Radford dam site or the drainage area below that point?

1670 A. The drainage area above the Radford dam site is enormously more productive of run-off during dry periods than is the drainage area below the Radford dam site. I am speaking of the yield of water on a square mile basis.

Q. Give us an explanation of this?

A. The comparative yield of water per square mile from these respective areas is well illustrated by conditions that prevailed in the month of October, 1930. During that month the flow—the mean flow at the Radford dam site was 760 cubic feet per second. The mean flow at Kanawha Falls gage was 1,130 cubic feet per second. Therefore, the drainage area of 2,382 square miles—the drainage area above the Radford dam site, contributed 760 cubic feet per second, and the 5,985 square miles between Radford dam site and Kanawha Falls gage contributed 370 cubic feet per second——

This will show, if computed, that each square mile of the drainage area above the Radford dam site contributed five times as much water as each square mile below, and between the Radford dam site and Kanawha Falls gage, during that particular month——

By Mr. JACKSON (interrupting). That is October, 1930?

A. Yes, sir.

By Mr. GATCHELL:

Q. What is the total drainage area of the Kanawha River basin?

A. It is 12,200 square miles.

Q. And you gave the drainage area at the Radford dam site as 2,382 square miles?

A. Yes, sir.

Q. And what percentage of the total drainage area of the Kanawha River basin lies above the Radford dam site?

A. Less than 20 per cent of the drainage area of the Kanawha River basin lies above the Radford dam site. It is 19½ percent, to be exact.

1671 Q. You gave a relatively high run-off per square mile from the drainage area above Radford dam site, as compared with the corresponding run-off below. Have you compiled any figures to show the relative run-off per square mile above the Radford dam site, as compared with the 9,818 square miles of drainage area below the Radford dam site?

1672 A. Yes, sir.

Q. Give those?

A. In a discussion of this matter of run-off in comparing drainage areas, it is convenient to use round figures, where the use of such figures will not introduce any appreciable error.

The drainage area above Radford dam site is 2400 square miles; and the drainage area—the remaining drainage area of the Kanawha basin lying below the Radford dam site is 9800 square miles, or a total of 12,200 square miles.

Q. Did you use these approximate figures in your computations?

A. No, sir; I just use these for convenience in speaking. I used the actual figures in the computations.

By the COURT:

Q. What were the actual figures in the actual computations?

A. 12,200 square miles for the entire basin; 2382 is above the Radford dam site, and 9818 below that point. During a 37 day period, from August 25th to September 30th, 1932, the mean flow of the New River at the Radford dam site, was 810 cubic feet per second; and the mean flow of the Kanawha River at its mouth was 1580 cubic feet per second.

By Mr. JACKSON:

Q. For what period?

A. August 25th to September 30th, 1932.

Q. And the other run-off?

A. The mean flow of the New River at the Radford dam site was 810 cubic feet per second; and the mean flow of the Kanawha River at its mouth was 1580 cubic feet per second. The yield of water from the 2382 square miles above the Radford dam site was 810 cubic feet per second and the yield of water from the 9818 square miles below the Radford dam site was 770 cubic feet per second. The yield per square mile from the drainage area above the Radford dam site was 4.3 times as great as the yield per square mile from the drainage area below the Radford dam site.

1673 Next I considered the 31 day period in the month of August—that is the entire month of August, 1930. During that month, the mean flow of the New River at the Radford dam site was 980 cubic feet per second, and the mean flow of the Kanawha River at its mouth was 1580 cubic feet per second. The yield of water from the 2384 square miles above Radford dam site was 980 cubic feet per second, and the yield from the 9818 square miles below was 600 cubic feet per second. The yield per square mile from the drainage area above the Radford dam site was 6.7 times as great as the yield per square mile from the drainage area below the Radford dam site.

I next considered the month of September, 1930, during which the mean flow of the New River at the Radford dam site was 847 cubic feet per second and the mean flow of the Kanawha River at its mouth was 1330 cubic feet per second. The yield of water from the 2382 square miles above the Radford dam site, was 847 cubic feet per second and the yield from the 9818 square miles below the Radford dam site was 483 cubic feet per second. The yield per square mile from the drainage area above the Radford dam site was 7.2 times as great as the yield per square mile from the drainage area below the Radford dam site.

I next considered the month of October, 1930. The mean flow of the New River at the Radford dam site that month was 760 cubic feet per second, and the mean flow of the Kanawha River at its mouth was 1150 cubic feet per second. The yield of water per square mile from the 2382 square miles above Radford dam site was 7—no; I did not mean to say that: The yield of water from the 2382 square miles above the Radford dam site, was 760 cubic feet per second, and the yield from the 9818 square miles below the Radford dam site was 391 cubic feet per second. The yield per square mile from the drainage area above Radford was 8 times as great as the yield per square mile from the drainage area below Radford.

I also compiled figures for the entire six month period from June 1st, to November 30th, 1930. During that six months period, the mean flow of the New River at the Radford

1674 dam site was 964 cubic feet per second, and the mean flow of the Kanawha River at its mouth was 1,660 cubic feet per second. The yield of water from the 2,382 square miles above the Radford dam site was therefore 964 cubic feet per second, and the yield from the 9,818 square miles below the Radford dam site was 696 cubic feet per second. The yield per square mile from the drainage area above the Radford dam site was 5.7 times as great as the yield per square mile from the drainage area below the Radford dam site, during that six months period.

Cross-examination by Mr. JACKSON:

Q. Mr. McWhorter, on your direct testimony you stated that you had caused some engineer to make a survey or examination along the shoals on New River. Was that engineer Mr. Gerdes who testified here in this case?

A. It was. I stated that I caused a competent engineer to examine all the shoals between Wylies Falls and Radford.

Q. I understand you to say you thought a competent engineer?

A. That was Mr. Gerdes.

Q. In any event, it was Mr. Gerdes who made that examination and the examination you have in mind is the one about which he testified here in court?

A. That is correct.

Q. You didn't mention his name and I didn't know but what it was someone else.

A. I didn't have any objection to mentioning his name.

Q. Mr. McWhorter, you enumerated a number of reports which you had read, including a report of the Chief of Engineers for 1891. You recall that, I presume?

A. I do.

Mr. JACKSON. I produce a photostat of what appears to be a typewritten report consisting of seven pages written upon the letterhead [partly obscured] of Craighill, Colonel, Corps 1675 of Engineers, United States Army, United States Engineer Office, 9 Pleasant Street, Baltimore, Maryland, April 17, 1891, addressed to Brigadier General T. L. Casey, Chief of Engineers, U. S. A., Washington, D. C., and signed by William P. Craighill, Colonel, Corps of Engineers, U. S. A., to which there is attached a photostat of a folder cover, bearing the stamp "Received Engineer Department April 20, 1921," and "Received War Department, April 21, 1891," bearing certain endorsements signed, the last one by the Acting Secretary of War, and ask to have it marked for identification as "Defendant's Exhibit 528."

Mr. GATCHELL. May I say that as this is a copy of one of the many documents we have gladly supplied to the defendant, we have no objection to its reference at this time.

By Mr. JACKSON:

Q. Mr. McWhorter, this document, Defendant's Exhibit 528, is the complete report of Major Craighill of which a part is reproduced in the report of Chief of Engineers for 1891. Do you know about that?

A. I know that a large part of what is in this letter is reproduced in the report of the Chief of Engineers for 1891.

Q. And did you, among the documents that you read, examine or read this document, Defendant's Exhibit 528, or a copy of it?

A. I did. I read every word of it.

Q. You produced and offered in evidence Exhibit 196, being a profile of New River. Do you know the Exhibit to which I refer?

A. I do.

Q. And you testified on your direct examination that the data from which those profiles appearing on Exhibit 196 were prepared are data appearing in certain reports of the Chief of Engineers; is that right?

A. I didn't say it appeared in the reports of the Chief of Engineers.

Q. What did you say you got it from?

A. I say I got it from the maps prepared from the surveys made in 1872—that was the Hutton survey of the Lead
1676 Mines-Greenbrier River reach of New River, the maps prepared from the survey of 1874 by Lieutenant Thomas Turtle under the direction of Major Craighill, covering that part of New River below the mouth of the Greenbrier and——

Q. The only point I want to get at is this: Plaintiff's Exhibit 196 is based upon data appearing on the reports or maps of certain reports of surveys made by Major Craighill or officers subordinate to him in 1872, 1874, and 1878?

A. All of the depths shown in yellow, as I explained at the beginning, were obtained from maps prepared as the result of the surveys of 1872, 1874, and 1878.

Q. Maps prepared by whom, Mr. McWhorter?

A. The maps of 1872 were prepared by the Army Engineers at Baltimore from the Hutton survey of the Lead Mines-Greenbrier section of New River and the maps of 1874 were also prepared by the Army Engineers at Baltimore from the survey of Lieutenant Thomas Turtle covering the portion of New River below the Greenbrier River. The maps of 1878 survey were prepared by the Army Engineers, Baltimore office, from the results of the survey made by William Proctor Smith, Civil Engineer, in 1878. The depths shown in red represent the two-foot low water depth provided by the United States in the 26½ mile reach above the steamboat landing at Hinton and in the 29¼ mile reach above the

New River bridge at Radford and in the 8 mile reach above Ivanhoe Furnace. The Green——

Q. I don't want to interrupt you, but you have described it once and if you get away from the point I want to ask you we will have to go back over it again. You told me first that the area in yellow was based upon data appearing in certain maps made by the Army Engineers from certain surveys made in 1872, 1874, and 1878, did you not?

A. That is correct.

Q. Are those maps published?

A. No; they are not published, not to my knowledge.

1677 Mr. JACKSON. Are they the maps you offered here in evidence?

Mr. GATCHELL. Yes.

A. I want to keep you straight on that. I don't believe that all of those maps have been offered as yet. They are all in Roanoke.

By Mr. JACKSON:

Q. The only point I am getting at, confining ourselves to this part of your chart, Exhibit 196, is intended to be merely an accurate reproduction of the data appearing upon these maps prepared by the Army Engineers; is that right?

A. Just as accurate as we could possibly make it. You understand that this red and this green does not appear on any of those old maps. It is only the yellow that appears on those maps—I mean it is only the yellow that is deduced from those maps.

Q. And therefore if these maps do in any way depart from the data shown on the maps of the Army Engineers which you have just described, that is an unintentional error, of course?

A. Yes; it certainly is.

Q. Turning now to the part which you have colored in red, the source of data from which you made that part of the graph is, I assume, the reports of the Army Engineers?

A. The reports of the Chief of Engineers, 1877 to 1889, inclusive, or 1890. Anyway, it includes all the work they did on the river within that period.

Q. It includes the various reports of the Chiefs of Engineers?

A. That is right.

Q. And it is intended, as far as that part of the graph is concerned, to accurately portray merely the data that you found or believed you found in those reports of the Chiefs of Engineers?

A. It is intended to show the sections of the river that were improved by the United States to provide a two-foot navigable depth below the low water surface.

1678 Q. Let us not argue about that, Mr. McWhorter. I am only trying to find out what your data is. Am I right in understanding that the red parts of the graph appearing on Exhibit 196 are based upon the information or data contained in the reports of the Chief of Engineers?

A. That is correct.

Q. And if the diagram, referring now to the red sections on Exhibit 196, departs from that data in any respect, it is an error, isn't it?

A. It would be unless there was some reason for it.

Q. You based it merely upon the data that you found in the Chiefs' reports, didn't you?

A. As far as I remember now.

Q. That is all you claim to have based it on?

A. That is all I remember.

Q. You think you may have based it on something you don't remember?

A. Well, I might have used something that would be perfectly good that I don't remember at this moment. I certainly didn't use anything unless I thought I was justified in using it.

Q. I am not questioning that, Mr. McWhorter. I am trying to find out what you used. To the best of your knowledge, what you used were the reports of the Chief of Engineers; is that right?

A. That is right. You are speaking only of the red now, that two foot channel?

Q. That is right. You have got certain area colored green. Is that based upon the survey of the witness, Mr. Gerdes?

A. That is based upon the survey—not a survey—examination, I call it.

Q. I think that is a better term.

A. The examination of the shoals made by Mr. Gerdes a month ago or such a matter, maybe less, and also to a large extent upon the Hutton survey of 1872. I want to explain that.

1679 That green strip there shows only two feet of navigable depth, where as for more than five-sixths of that distance the navigable depth ranges from four to six feet.

Mr. JACKSON. I move to strike out the statement that it shows any navigable depth.

Q. What I want to find out then is merely upon what data you base it and am I right in understanding that you base it upon Mr. Gerdes' examination?

A. Not entirely. I base it upon his examination and the Hutton Survey of 1872, and I knew for five-sixths of this distance that this two feet does not show correctly. It simply shows that the minimum depth is two feet except as otherwise shown on the pro-

file and at all other places, covering five-sixths of that distance or more, the depth is much greater than two feet.

Q. In case of divergence, did you conform this green area to Mr. Gerdes' examination or to Mr. Hutton's survey?

A. I have already explained I didn't attempt to show it more than two feet although I knew it to be more than two feet and very substantially more than two feet.

Q. I am asking you in case of any divergence did you conform it to Mr. Gerdes' examination or Mr. Hutton's survey?

A. At all the shoals I conformed it to Mr. Gerdes' survey except at those shoals where he found the depth greater than two feet and at those places I showed it as two feet.

Q. I understand you didn't show anything more——

A. I showed it as two feet just like I showed the Hutton part two feet.

Q. If a pool were ten feet deep you didn't show that?

A. If it was ten feet deep I showed it as two feet or if it was four feet deep on the shoal I showed it as two feet.

Q. Can you point out the places where Mr. Gerdes reported one foot on the shoals on that green part?

A. Yes.

Q. Where is it?

1680 A. Mr. Gerdes reported one foot at Sifford's Falls, from mile 125 to mile 127.3, about. Just above the head of that Sifford's Falls, and so close to it that we couldn't show it on a map of this scale, is another little place, just a few feet, at a depth of one foot. That doesn't appear because it is just the upper part of Sifford's Falls. I am calling attention to it because I want to give you as accurately as I possibly can exactly what obtains on the river. At mile 130½ is a place where the depth is 1.8 feet.

Q. I would like to ask you a question about your Exhibit 197.

A. You didn't want these other places where it was less than two feet?

Q. No; I only asked you for the one foot measurement. I think the others can be read on the graph.

A. There is no place where it is less than one and one-half except at Sifford's Falls.

Q. You, I believe, testified that New River was not shown to scale on Exhibit #197?

A. That is right.

Q. Is it magnified at any particular rate?

A. I would have to figure it out.

Q. I didn't know if you had it magnified or not.

A. I didn't attempt to magnify any particular thing, but simply to portray it with meticulous accuracy.

Q. Is it shown twice as wide or five times, or do you know?

A. I would say it is shown—if you would actually scale it—it would probably be about two and one-half times, maybe, but we were not trying to show the width of the river.

Q. As I understand it, all you know about these questions of acquisitions and periods of construction of these railroads, is certain data was given you at the Interstate Commerce Commission?

1681 A. This exact data was supplied to us at the offices of the Interstate Commerce Commission. It is exactly as it was furnished to us.

Q. Yes; I wasn't questioning that. Will you define "low water depth or depth at low water" as you have used it in the interpretation of the surveys of 1872, 1874 and 1878?

A. Yes, sir; on 1872 Mr. Hutton, a civilian engineer, under Major Craighill, made the survey of the Lead Mines to the mouth of Greenbrier river [interrupted].

Q. I merely asked you to define it.

A. I will have to give you a little background.

Q. I should think you could define it without a background.

A. Mr. Hutton said the inhabitants, I am not certain whether I have the right report or not, it was either Mr. Hutton or Mr. Smith—let me see—those reports, of course, speak for themselves.

Q. I just wanted you to define low water depths or depth at low water, as you used it in interpreting these reports and surveys?

A. I want you to understand that I did not say that the water surface found by Hutton between the Lead Mines and the Greenbrier, and the water surface found by Smith between the mouth of Wilson Creek and the Lead Mines, was low water. I did not testify that. I said these depths are the depths below the water surface that obtained at the time of those surveys.

Q. You didn't undertake to interpret these maps so as to show depths at low water?

A. Extreme low water?

Q. Yes.

A. Mr. Hutton or Mr. Smith one stated the inhabitants told him the water had been 3″ or 4″ lower than it was at the time he was making the survey. I can't show 3″ or 4″ on the profile, but I can show 3′ or 4′ in accordance with my depth scale.

1682 Q. What I am wanting to get at, I am sure you understand me, is whether in interpreting the data appearing on these maps of the army engineers, for the purpose for instance of preparing that part of your graph on your Exhibit #196 shown in yellow, did you assume a certain low water flow?

A. No; I took the depths below the water surface that obtained when Hutton and Smith and Turtle made those surveys.

Q. So you didn't construct this chart on the basis of any particular low water flow?

A. No; but when Turtle made his survey in 1874 he said it was during the low water of 1874, and that is all I know about it.

Q. You do not know what it was?

A. No; and Smith said the water was low when he made his survey, and the inhabitants told him they had seen it 3″ or 4″ lower.

Q. You testified about the scale on #196, and it was not quite clear to me. You said the horizontal scale was 1″ to the mile on the large chart you used for illustrative purposes. Now on the small chart offered in evidence you said it was about 1/3″ did you not?

A. It takes about 3¼ or 3½ miles per inch. This is a photographic reproduction of that and no scale except the miles, you can tell exactly what they are, for the mileage is on there for each section.

Q. For instance on the depth scale that scale is inapplicable to the chart as it is reproduced by photograph?

A. No, sir; the depth scale is reproduced on this chart, the scale is reduced in the same proportion that the indicated depth is reduced.

Q. It wasn't clear to me is all.

A. That is all right so far as I can see.

1683 By leave of Court the following questions were asked on direct examination:

By Mr. GATCHELL:

Q. Mr. McWhorter, if the New River is entirely shut off at the Radford plant for a period of two, three or more days, what would be the effect upon the power plants on the Kanawha River at the London, Marmet and Winfield dams during times of low flow?

Mr. JACKSON. We object to that question for the same reason that we have objected to all questions dealing with alleged injury to Government power.

The COURT. I will let it be answered for the same reason that I indicated the other day, that I want all information that I can have of that sort about the operations.

Mr. JACKSON. May we have our exception noted for the record.

A. If the flow of New River should be impounded for two or three days at a time or for longer periods during low flow, the power plants at Marmet, London and Winfield would be out of

commission because of lack of water until resumption of the natural flow of the river. The Radford plant would be out of commission for two or three days at a time and it would be out of commission for longer periods.

By Mr. JACKSON:

Q. You are talking about the Radford plant now?

A. I am talking about the Radford plant.

By Mr. GATCHELL:

Q. The Radford plant would be out of commission or would be shut down?

A. It would be either shut down or it would be floating with no generation and no discharge of water below the dam for two or three days at a time and also for longer periods.

Q. Is that the normal and customary manner of operating such a plant?

1684 A. It is. It is the rule, rather than the exception, to shut such plants down over week-ends. It is also a frequent occurrence to shut such plants down for longer periods than two or three days.

By Mr. JACKSON:

Q. Mr. McWhorter, have you ever had charge of the operations of Wicket dams?

A. No, sir.

Q. The operation of such dams has never been under your supervision, has it?

A. No; but I know how they operate.

Q. Well, I do too. You stated, I think, that you worked for the Government for four and one-half years on the construction of Hale's Bar Dam?

A. I did.

Q. Isn't it a fact that Hale's Bar Dam was constructed by private individuals?

A. Hale's Bar Dam was constructed by the Chattanooga and Tennessee River Power Company, as I recall the name, but it was under Government supervision and Government inspection the entire period from the time it was started until the last day of its completion.

Q. You will, of course, agree that it would be physically possible to operate the Radford project on any basis between run-of-river and the extreme basis of peaking, which you assume?

A. It will be possible to operate it in different ways. I think to operate it in a freak, unusual, exceptional, and uneconomical way, would be folly, but it would be possible.

ERRATA

Pages 1273 and 1274:

The last six lines of page 1273 and the first seventeen lines of page 1274 should be transposed to page 1289.

Q. So far as the economics of the operation are concerned, there is no difficulty in operating it over any variation between run of river and extreme peaking, is there?

A. No; you could hold it there and not operate it at all.

Q. I didn't ask you about that. Will you answer my question?

A. I don't know whether the answer is no or yes, I don't remember the form of your question.

Q. Read the question?

(Question read.)

A. You could operate it as a base load plant or anywhere between that and peaking plant, as you will operate it, but it would be uneconomical to operate it as anything except for carrying peak load, or as a peak carrying plant.

Q. Who told you how we would operate it?

A. Your application tells me how you will operate it. The very nature of the project tells me how you will operate it. There cannot be any doubt in my mind——

Q. Your job was on the inspection, I presume?

A. I served in various capacities. I first served as an inspector and after about a year I served as an engineer.

Q. You testified that you have been in charge of various works being carried on by the United States in connection with the Tennessee River and the Great Lakes and St. Lawrence and various reports that were being made. Is it not a fact that each of those projects and reports was under the responsible charge of some officer of the Corps of Engineers of the United States under whose direction and supervision you worked?

A. I testified about the report on Muscle Shoals. The District Engineer who was at that time Major Burgess was in responsible charge of the district. I, like the other engineers on that investigation, worked under him. On the St. Lawrence River work I testified that I was principal engineer assistant to the American section of the joint Board of Engineers which the record shows.

Q. Who was the head of that—General Pillsbury?

A. General Pillsbury was Chairman of the American section, the present Assistant Chief of Engineers.

Q. Am I right in understanding since you have been at school your experience has wholly been in public employ?

A. Not wholly in the Government service.

Q. Not the Federal Government, but some public body?

A. My experience has been continuous. It has been upon hydraulic engineering work at all times, with the Federal Government for a considerable part of the time, with the Miami Conservancy District, a political subdivision of the State of Ohio for seven years; I was consulting engineer for the Orleans Levee district and the City of New Orleans for two years.

Q. I appreciate that. If you will produce them they can be checked. This Exhibit 197 is entitled "Railroads" and in the upper right-hand corner there is a column headed "Period of Construction" which confuses me a little. What is the purpose of that column? What is it intended to show?

A. To show when the railroads were constructed.

Q. By examining that column, or any other data on your map, Exhibit 197, is it possible to tell when any particular section or division of the railroad was completed and placed in operation?

A. By examining that column and what else?

Q. Anything else on your exhibit?

A. Well, the first one shows 1860 to 1861. That is clear enough. The next one 1867 to '73. Within that six years that railroad was built.

Q. Let us take that. Your item 1 purports to cover the main line of the Chesapeake & Ohio between Covington and Huntington and to show that it was constructed during the period 1860 to 1861 and 1867 to '73. Do you know when that railroad reached Hinton?

A. No. It was in the early seventies, as I recall.

Q. Isn't it a fact it reached there somewhere around 1872?

A. Somewhere around that time. You understand we didn't know when these railroads were built. We went to the Interstate Commerce Commission and got this information.

Q. I understand. My difficulty is that information of a railroad covering a wide area that was built anywhere from eight to ten years doesn't seem to me, from anything that I know of, to be very helpful. Take again the New River Division of the Norfolk & Western. Do you know where that is?

A. What number is it on this chart?

Q. I can't find it on this chart; I don't know.

A. Do you mean the railroad that crosses the river up here at Hiawassa?

Q. Don't you know that the New River Division commenced at New River Bridge and extended down to Glen Lyn and then over to Bluefield and westward to the Pocahontas coal fields?

A. You say it starts at New River Bridge?

Q. You don't show that on your maps, but it would be just across the river from Radford, about.

A. We have a Norfolk & Western Railroad just across the river from Radford extending upstream.

Q. This extends downstream to Glen Lyn, from New River Bridge down to Glen Lyn and thence to Bluefield and thence westward to Pocahontas.

A. If you will look on there you will see the railroad crossing the river below Radford and extending down the river to the Narrows and to Glen Lyn and then going westerly to Bluefield.

Q. You understand that the New River Division was not built as you show it, but was built down the other side of the river from New River Bridge Depot toward Glen Lyn, don't you?

A. There is a railroad on both sides of the river there.

Q. The Norfolk & Western we are talking about.

A. There is no Norfolk & Western shown on the right bank of the river on this map, that is immediately below Radford.

Q. Well, isn't it a fact that the New River Division started at New River Bridge just on the left bank of the river from Radford, went downstream to Glen Lyn and thence over to Bluefield and thence west to Pocahontas?

A. I don't know.

Q. Don't you know that that division was begun in 1880 and finished in 1883?

A. No; I don't know that.

Q. There is nothing on your map to tell one way or the other, is there?

A. Let me get clear on that. You say that the Norfolk & Western built a line of railroad along the left bank of the river from New River Bridge?

Q. Down to Glen Lyn, thence to Bluefield, thence west to Pocahontas.

A. We have got the Norfolk & Western here going down the left bank of the river to Glen Lyn, thence west to Bluefield. The only thing that is missing there is a link on the left bank between New River Bridge and the Norfolk & Western Railroad at the point where it crosses from the right bank to the left bank.

Q. You will notice that your item 9, Mr. McWhorter——

A. Let me find out this first. Are you contending that they built two separate lines of railroads down the left bank of the river?

Q. No; I merely say that the original New River Division extended from the New River Bridge on the left bank of the river across from Radford down to Glen Lyn and thence to Bluefield and thence west.

A. I have told you that I don't know whether the line we have shown on here was the original but all that is lacking is the connection from New River Bridge on the left bank of the river to this line that we have shown.

Q. I am coming to something else if you won't be so anxious to argue about it and let me bring to your attention the point I would like to have you tell me about. Will you turn to Item

9 on your chart, "Branch between Glen Lyn and Bluefield to Norton." Don't you know it to be a fact that the railroad from Glen Lyn to Bluefield is part of the main line and part of the New River Division as it was originally constructed, that is the division that commenced at New River Bridge, went down to Glen Lyn, west to Bluefield, and on west to the Pocahontas coal fields?

A. No; I know that the Norfolk & Western had a railroad extending from Glen Lyn to Bluefield as shown.

Q. And west to Pocahontas?

A. It goes on west. I don't know where it goes. I wasn't particularly concerned with where it went west.

Q. Isn't it a fact that that New River Division construction was begun in 1880 and that it was completed by continuous construction from New River Bridge through Glen Lyn to Bluefield and on to Pocahontas and placed in operation in 1883?

A. I don't know when that railroad was completed over there west of where we have shown it here or when it was placed in operation. All I know is that the information shown on this chart as to when these railroads were built is the information that we got from the Interstate Commerce Commission which we assumed to be correct.

Q. The point is you don't know anything about it personally, do you?

A. All I know is what the Interstate Commerce Commission gave us.

Q. And that doesn't tell you when the New River Division was commenced or completed, does it?

A. It tells approximately when all of these railroads—it gives the bracket of years when they were built.

Q. That includes a great many other things than the New River Division?

A. I would say that the construction was completed in the last year given.

Q. Your testimony is that the construction, for instance, to Bluefield which was part of the New River Division, was completed in 1891, referring to your Item 9 on the map?

A. That is the information we got, that it was constructed in that four-year period from 1887 to 1891.

Q. As a matter of fact, didn't you investigate enough to find out that the railroad between Glen Lyn and Bluefield is not a branch at all but a part of the main line of the Norfolk & Western?

A. We didn't attach any great importance to the type of line that is. All we wanted to show on the map was the existence of that railroad at that place.

Q. Were you trying to show when any of the divisions or parts of these railroads were constructed or placed in operation?

A. We were seeking only to compile or prepare an accurate map showing reliable information. We had absolutely no desire to show anything else.

Q. (The question was read.)

A. We were trying to show when all of these railroads were constructed and placed in operation.

Q. Mr. McWhorter, you understand me. You know what a division of a railroad is, don't you?

A. Yes.

Q. Were you trying to show on this map, or pretending to show on this map when the New River Division or any other division of the Norfolk & Western was completed and placed in operation?

A. Not particularly. We were trying to show the information that is embodied in that tabulation in the upper right-hand corner of the map or chart.

Q. You say "Not particularly." You weren't trying to show and you weren't able to show, were you, from the data that you had when any particular division such as the New River Division of the Norfolk & Western was constructed and placed in operation?

A. Not any particular segment of line. We were attempting to show the best information we could possibly obtain about all of these railroads in the New and Kanawha River Valley.

Q. Do you know where the Cripple Creek Division of the Norfolk & Western is shown on this map, Exhibit 197?

A. Where does it extend from and to? I know the general locality of that line. It is up there in the vicinity of Ivanhoe Furnace. Isn't that line extending from Dora to Allisonia to Austinville to Ivanhoe the line you speak of?

Q. That is the Cripple Creek Division, isn't it?

A. That is what I take it to be.

Q. Isn't it a fact that that Cripple Creek Division from Dora, formerly known as Martin's Tank, as I understand it, near Pulaski, up to Foster's Falls some miles above Allisonia, was commenced in 1883 and completed in 1886?

A. This chart shows within the period 1881 to 1888.

Q. That covers a much larger section, doesn't it?

A. I am unable to tell you whether that particular line was built in the period 1883 to 1886, or not.

Q. Did you find out that there was no intermediate operation on that line between the years 1883 and 1886?

A. I did not.

Q. You don't know anything about that, do you?

A. All I know is when it was built.

Q. All you know is that the Interstate Commerce Commission gave you some figures as an over-all period during which certain railroads were built; is that so?

A. They gave us a seven-year period within which that particular line was built, from 1881 to 1888.

Q. And that included a good deal more than the distance from Dora to Foster's Falls, didn't it?

A. I believe it did.

Q. You know it did, don't you?

A. I don't know. I think it did.

(Defendant's exhibit 529, being letter dated February 4, 1930, from Appalachian Electric Power Co. by Curtis, Mallet-Prevost, Colt & Mosle to the Federal Power Commission re minor-part license, marked for identification.)

(Defendant's exhibit 530, being memorandum dated February 4, 1930, re minor-part license prepared by Curtis, Mallet-Prevost, Colt & Mosle, marked for identification.)

Q. I show you, Mr. McWhorter, Defendant's Exhibit 530 and ask you whether or not in your examination of this file you did not find that a copy of this exhibit was in the files of the Federal Power Commission and whether it is not the memorandum referred to in Exhibit 529?

A. My answer is that I have read everything in the Federal Power Commission's files relating to this project and if this is in there I have read it. I would have to read this to see if I can recognize what is in it and tie it in with things that I have read in the files.

X Q. I produce a photostatic copy of a letter, on the letterhead of the Federal Power Commission, dated July 21, 1930, addressed to the Attorney General of the United States, and signed by Patrick J. Hurley, Secretary of War, as Acting Chairman of the Federal Power Commission, and ask to have it marked "Defendant's Exhibit #531," for identification.

NOTE.—Letter was marked for identification "Defendant's Exhibit #531."

X Q. I show you Exhibit #531 marked for identification, and ask you whether or not you can identify that as a photostat of one of the documents in the file of the Federal Power Commission dealing with the application of the defendant for a license, which you examined, and in regard to which you undertook to say what, if any, modifications had been made of the license or the application rather?

X Q. I produce here a document headed "Department of Justice, Washington, D. C., September 22, 1930, addressed to the President and signed Wm. D. Mitchell, Attorney General," and

bearing at the top the notation, "The following opinion of the Attorney General was released by the Federal Power Commission September 26, 1930." The paper consists of nine typewritten or mimeographed sheets, and ask to have it marked "Defendant's Exhibit #532," for identification.

NOTE.—Document marked "Defendant's Exhibit #532," for identification.

X Q. I show you Exhibit #532 marked for identification, and ask if you found a copy of that document in your examination of the file lealing with the application of this defendant for a minor part license?

A. I don't recall this document in the files, but I have read this opinion, and I know that the Attorney General's opinion was at variance with the opinion of the Commission's counsel, and the Commission did not follow the opinion of the Attorney General.

X Q. Did you understand me to ask you if the opinion was at variance with the opinion of the Commission's counsel?

A. No; but I thought you would want that information.

X Q. Why did you volunteer that answer?

A. It was the facts.

X Q. You don't have any interest in the matter, do you?

A. I do have an interest.

X Q. You say you did not go to the Commission until 1931?

A. June 27, 1931.

X Q. Did you or did you not testify that the application of the defendant was amended by a letter dated October 16, 1930?

A. I testified the Appalachian Electric Power Company sent a letter to the Commission.

X Q. October 16, 1930, you said?

A. Dated October 16, 1930, with which plans different from those submitted with the application for license were filed with the Commission. I simply testified the company did that as shown by the records of the Federal Power Commission.

X Q. Can you tell me, Mr. McWhorter, why your memory and knowledge is so much more certain about the letter of October 16, 1930, which was received, if at all, before you came with the Commission, than it is about the other documents to which I have referred?

A. Because I particularly noted that date. I testified that last opinion you showed me I had read. I remember specifically reading that in the annual report of the Federal Power Commission, I believe for the year 1926. I do not specifically remember reading it in the files any more than the previous letter you showed me.

X Q. I produce a letter dated October 6, 1930, addressed to the Federal Power Commission, signed Appalachian Electric Power Company, by Curtis, Mallet-Prevost, Colt & Mosle, and ask to have it marked "Defendant's Exhibit #533" for identification.

NOTE.—Letter dated October 6, 1930, marked for identification as "Defendant's Exhibit #533."

X Q. And I produce a further document which appears to be a photostat copy of letter dated October 16, 1930, addressed to the Federal Power Commission, Washington, D. C., and signed Appalachian Electric Power Company, by Curtis, Mallet-Prevost, Colt & Mosle, and ask to have it marked "Defendant's Exhibit #534" for identification.

NOTE.—Letter dated October 16, 1930, marked for identification as "Defendant's Exhibit #534."

X Q. I show you Defendant's Exhibit #533, marked for identification, and Defendant's Exhibit #534, marked for identification, and ask you whether or not Exhibit #533 marked for identification does not refer to the so-called amendment of the application, about which you testified yesterday, and which you said is set forth more particularly in Defendant's Exhibit #534, the letter of October 16, 1930?

A. Did I say that, or did you say that?

X Q. I understood you to say that was in this letter.

A. I didn't refer to this letter so far as I know. I stated those amended maps were with the letter of October 16, 1930, and did not make any reference to the letter of October 6, 1930.

X Q. This letter, Exhibit #533, is a letter advising the Commission the defendant is about to file a revision of its plans with its application, isn't it?

By Mr. GATCHELL. We don't like to be captious about this, but they are still attempting to have this witness identify letters purporting to be sent to the Commission prior to the time he came with them. The letter speaks for itself. If they want to introduce it when their time comes, they can do so.

By Mr. JACKSON. We aren't introducing it, but I don't think he should identify documents before he came with the Commission he likes, and object to identifying any he doesn't like.

By the COURT. The only serious objection I can see is you are utilizing this witness to identify exhibits which ought to be identified by your own witnesses. I have permitted that throughout the case, because it struck me it would simplify the matter and hasten things, and I don't see why it should not be done. Now the question is whether or not this matter was received by the Commission. If this witness can say it was in the files when he went there, I can't see there is any objection. Is there any dispute about it?

By Mr. GATCHELL. No particular dispute that the Commission had some, but as to others we say there is, and the main point about the last letters, preceding the one he now has, is whether the Commission itself saw the matters to which counsel has referred, namely, the memorandum whether the Commission should issue a minor part or major license. If this witness was not with the Commission when that was received, how can he tell if the Commission saw it, if it was in the files there, and this witness is not the one to tell about this letter.

By the COURT. Nor is anyone else. When an applicant dealing with the Government addresses a communication to the Government, and such communications are in the files, I think the Court would presume that they were seen by the Commission.

X Q. Did you find that Exhibit #533 marked for identification, or copy of it, in the files?

A. I don't remember this letter of October 6th at all. I do remember the letter of October 16th very clearly.

X Q. To refresh your recollection I direct your attention to this statement in the letter of October 6, 1930, Exhibit #533, marked for identification, "in this connection we intend shortly to submit to you appropriate copies of revised plans to be substituted for certain plans filed with you," and ask if that doesn't refresh your recollection as to this letter being in the files?

A. No; that doesn't refresh my recollection. If I should look in the files I would expect to find that.

X Q. This Exhibit #534, marked for identification, dated October 16, 1930, is the one about which you testified on your direct examination?

A. Yes, sir; it is. I remember this letter and do not remember the other letter.

X Q. To keep the record perfectly clear, what you are now telling me is that the notation on these revised maps, which reads:

"War Department—Approved so far as the plans affect the navigable capacity of navigable waters of the United States, November 1930, Patrick J. Hurley, Secretary of War—November 5, 1930, Lytle Brown, Major General, Chief of Engineers."

was not on these maps when they were received?

A. No; they came from the Power Commission and as is customary they were sent to the Chief of Engineer's Office for consideration, and as is customary if the Chief of Engineers and Secretary of War find the proposed construction [interrupted].

By Mr. JACKSON. I object to the witness stating what is the custom as incompetent.

By the COURT. Overruled.

By Mr. JACKSON. Exception.

A. (Continuing.) The Power Commission submits these maps and plans to the Chief of Engineers and Secretary of War, because the Federal Power act requires that in the event of the proposal of any applicant to construct works or structures which would affect the navigable capacity of any navigable water of the United States, that the construction—before construction can be commenced, those plans must have the approval of the Chief of Engineers and the Secretary of War. Now, of course the Chief of Engineers and the Secretary of War in this case never on earth would have signed these plans except on condition they would be made a part of a license issued by the Federal Power Commission.

By Mr. JACKSON. I renew my objection, and move to strike out the statement as to what the Secretary of War and Chief of Engineers would have done.

By the COURT:

Q. I do not understand what you mean they would not approve them unless made a part of the license. As I understand they approve the construction of projects based on certain plans that have been submitted?

A. They approve them conditionally, your Honor, and that approval carries with it the prescription of numerous special conditions for insertion in the license.

Q. Conditions revealed by the plans?

A. They are contained in the recommendations for insertion in the license for protection of navigation.

Q. Did the Chief Engineer of the Federal Power Commission submit his recommendation?

A. I take it you mean the Chief of Engineers.

Q. The Chief of Engineers submits to the Secretary of War his recommendations?

A. Submits to the Federal Power Commission his recommendations of provisions for insertions in the license.

Q. Let's get this straight. Here are a set of plans and application for license, as I understand submitted to the Secretary of War, as required by law, and there has been stamped on the plans the approval of the Secretary of War approved so far as the plans affect the navigable capacity of navigable waters of the United States?

A. Yes, your Honor; but attendant upon that approval, and as a part of it, were numerous recommendations for special provisions in the license for protection of navigation.

Q. You mean when these plans came back to the Water Power Commission they were accompanied by recommendations to be included in the license?

A. About that time, or somewhat earlier than that time, the Department's recommendations had been filed with the Commission.

Q. Suppose it were before that time; this would indicate the War Department—would indicate these plans conformed to the recommendations of the War Department, otherwise they would not have been approved?

A. Not unless those provisions were inserted to protect navigation. To clear that up, in June 1934, the Appalachian Electric Power Company notified the Secretary of War it was beginning the construction of this project. The Secretary of War replied that the provisions [interrupted].

By Mr. JACKSON. I object to what the Secretary of War replied.

By the COURT. Let him finish.

A. (Continuing.) Replied to the Appalachian Electric Power Company that he would not at that time prescribe any conditions directly to the company, but that the provisions for the protection of navigation would be included in the license issued by the Federal Power Commission for this project, such provisions being necessary for the protection of the interests of navigation.

Q. Let's go back to 1930, regarding this approval by the Secretary of War. Why did he approve these plans unless they revealed conditions which, in his opinion, made the operation of that plant such as would not interfere with the navigable capacity or unless he had been satisfied by some memoranda apart from this as to the method of operation, which he felt justified in approving?

A. I will tell you how those things are handled. These applications for water-power projects are filed with the Federal Power Commission. If those projects would affect the navigable capacity of any navigable water of the United States the Commission refers them to the Chief of Engineers of the War Department for examination and report. The Chief of Engineers submits a report to the Commission, with his recommendations of provisions to be inserted in the license for the protection of navigation, and after we get those recommendations, then we take the tracings which the applicant has submitted, and with that information we have received from the Chief of Engineers, we send those tracings over there for the formality of getting his signature, and the Secretary of War's signature approving those plans on the condition the license shall embody those plans and also shall contain the special provisions the War Department has recommended for the protection of Interstate Commerce.

Q. And after all that has been done, and was done in this case, the Secretary of War approved these plans?

A. Yes, sir; but the Secretary of War and Chief of Engineers approved those plans with the provision all those provisions as were recommended, would be inserted in the license, and become a part of the license.

Q. Were those conditions inserted in the license?

A. To the best of my knowledge and belief substantially all of them were inserted in the license and such changes as were made were made after consultation with the Chief of Engineers.

By the COURT. What I am getting at is, as late as November 1930, after the submission of the plans to the Secretary of War, and knowledge on his part of those plans, and of the conditions of operation imposed in connection with those plans, he approved them as not interfering with navigation.

By Mr. JACKSON:

X Q. I now produce a letter on the letterhead of the War Department, Office of the Chief of Engineers, dated November 7, 1930, addressed to the Executive Secretary, Federal Power Commission, Washington, D. C., and signed for the Chief of Engineers by Major John J. Kingman, and ask to have it marked for identification as "Defendant's Exhibit #535."

NOTE.—Letter of November 7, 1930, marked as "Defendant's Exhibit #535."

X Q. I direct your attention to this Exhibit #535, marked for identification [reading]:

"(1) Reference is made to your letter of October 17, 1930, requesting approval by the Chief of Engineers and the Secretary of War of tracings accompanying the application of the Appalachian Electric Power Company (Project 739) for a minor-part license to develop water power on the New River, near Radford, Va.

"(2) In reply I would inform you that the plans, which have been examined and found satisfactory so far as the interests of navigation are concerned, have been approved by the Chief of Engineers, and the Secretary of War, and are returned herewith.

"(3) It is understood the construction of the project will be under the supervision of this office, that all work will be done to the satisfaction of the District Engineer in charge, and that detailed plans will be submitted to him for approval as he may direct.

"(4) It is requested that the conditions suggested in your letter of October 3, 1930, and approved in the letter of October 10, 1930, be revised to read as follows:

"Whenever the flow at Lock #2 at Kanawha River falls below 1,400 second-feet, the licensee shall, when so directed by the

Secretary of War, discharge in each twenty-four hours, the natural flow of the river at the dam site during that period up to a discharge of 1,150 acre-feet, the discharge from the project shall at all times be regulated by such rules and regulations as the Secretary of War may prescribe to prevent undue interference with navigation on the Kanawha River."

I will ask you whether or not you found that letter, marked for identification "Defendant's Exhibit #535," in the files of the Federal Power Commission; dealing with the application of the Appalachian Electric Power Company?

A. I did, and it shows on its face that as late as November 7, 1930, the Chief of Engineers submitted a recommendation showing his signing of those plans did carry with it the reservation that the license to be issued should contain that particular special provision for the protection of navigation.

(Defendant's exhibit 536, being letter dated October 31, 1930, from Bonner, Executive Secretary of Federal Power Commission, to Appalachian Electric Power Co., enclosing draft of minor-part license, marked for identification.)

Q. Then let me produce here an original letter, on the letterhead of the Federal Power Commission, dated November 6, 1930, addressed to Appalachian Electric Power Company and signed by F. E. Bonner, Executive Secretary, to which is attached an enclosure, 1088 from Federal Power Commission, U. S. Govt. Printing Office 1927. The inclosure, composed of several typewritten sheets bears the title "Federal Power Commission, Minor Part License on Non-Navigable Waters. Project No. 739—Virginia—Appalachian Electric Power Company," and will ask you whether or not you found that letter or a copy of it, and the inclosure in the files when you examined the files with regard to the application for license of this defendant, of the Radford project.

A. I do not remember that this Commission ever tendered any such license.

Q. I did not ask you that question. I asked you if you did not see this letter or a copy of this memorandum in the files of the Federal Power Commission?

A. I may have seen it since I have been with the Commission for the past five years, but I do not remember it.

(Letter and memo marked for identification, "Defendant's Exhibit 537.")

By Mr. JACKSON. For the record, I will state that the document which has been shown to the witness has been marked "Defendant's Exhibit 537," for identification and consists of a letter dated November 6, 1930, signed by F. E. Bonner, Executive Sec-

retary, and addressed to the defendant, together with the inclosure headed "Federal Power Commission, Minor Part License on Non-Navigable Waters, Project No. 739—Virginia—Appalachian Electric Power Company," which I have described somewhat more particularly before.

Q. Now I produce what appears to be a photostat of a letter dated November 8, 1930, addressed to General Brown, Chief of Engineers, and signed F. E. Bonner, Executive Secretary, and will ask to have it marked "Defendant's Exhibit 538," for identification?

(Said letter is marked "Defendant's Exhibit 538" for identification.)

Q. Mr. McWhorter, I direct your attention to Defendant's Exhibit 538, being a letter reading:

"DEAR GENERAL BROWN: I have Col. Kingman's letter of November 7, regarding approval of the plans, for the project on New River near Radford, Virginia, contemplated by the pending license application, (No. 739) of the Appalachian Electric Power Company.

In preparing this case for presentation to the Commission for final action a question has been raised regarding the formal finding made by the Commission on June 1, 1927, that the portion of New River embracing the proposed project works is not 'navigable waters' within the definition of the Act."

Q. Can you identify Defendant's Exhibit 538 as being a copy of a letter in the files of the Federal Power Commission, dealing with the application of the defendant for a Minor-Part license?

A. I do not remember this particular letter. Of course, I have knowledge of that whole controversy.

Q. Do you wish to testify that you cannot identify this Exhibit 538 as one of the letters in the files of the Federal Power Commission?

A. I do.

Q. I now produce letter on the letterhead of the Federal Power Commission dated December 15, 1930, with the following words in the left-hand corner "EP–739—Virginia, Appalachian Electric Power Co." addressed to Curtis, Mallet-Prevost, Colt & Mosle, New York City, and signed by F. E. Bonner, Executive Secretary, to which is attached a further typewritten sheet with a printed form on the typewritten sheet reading: "Inclosure 7992, from Federal Power Commission, U. S. Govt. Printing Office 1927." Being marked "Copy. War Department, office of the Chief of Engineers, Washington, November 11, 1930, addressed to The Executive Secretary, Federal Power Commission, Department of the Interior, Washington, D. C." and signed "Lytle Brown, Major General, Chief of Engineers," and will ask to

have the letter marked "Defendant's Exhibit 539A, for identification, and the enclosure marked "Defendant's Exhibit 539B for identification."

(Said letter and inclosure marked "Defendant's Exhibits 539A and 539B for identification.")

Q. Mr. McWhorter, I show you defendant's Exhibit 539A and Defendant's Exhibit 539B and ask you if you can identify those exhibits as documents, the originals, or copies of which you found in the files of the Federal Power Commission, dealing with the application of this defendant for a Minor-Part License?

A. I am not certain whether I remember these particular letters or not. As stated before, I have general information about this entire matter, but I do not remember particularly about these two letters.

Q. In your direct testimony you said you had examined every report of the Chief of Engineers in connection with this application, did you not?

A. Yes. I said I had examined every report of the Chief of Engineers, and if that is in the files, I have examined that, too.

Q. Does not the report of General Brown refer to Project 739, Appalachian Electric Power Company?

A. It does. All I had to do is to examine the files which we have here, and I can do that.

Q. Isn't that project 739?

A. It is. I can look in the files there and find out in two or three minutes.

Q. If you have the files here, will you look at them at noon recess and let us check about these documents, about which your memory is infirm, and let us see if they are in the file?

By Mr. GATCHELL. If they want this witness to look in the files and see if they are in there, that is one thing, but for them to examine our files is quite another matter. I do not know just what the object is, in going through our files. If he wants the witness to take the exhibits he has marked for identification and see if they are in the files, that is all right.

By the COURT. I think that is the proper way to do it.

By Mr. JACKSON:

Q. I now produce a letter on the letterhead of the Federal Power Commission dated November 28, 1930, addressed to the Appalachian Electric Power Co., signed F. E. Bonner, executive secretary, to which is attached what purports to be a certified copy of the action of the Federal Power Commission upon application of the defendant for Minor-Part license, and will ask to have the letter marked "Defendant's Exhibit 540A for indentification" and the inclosure "Defendant's Exhibit 540B for identification."

(Said letter and inclosure are here marked for indentification "Defendant's Exhibits 540A and 540B.")

I show you defendant's Exhibit 540A and Defendant's Exhibit 540B for identification, and will ask you if you can identify the letter and document attached thereto as being a letter and document of which either the original or copy is in the files of the Commission, dealing with the Minor-Part license of the defendant?

A. May I ask if this is a letter addressed to Col. F. W. Scheidenhelm or to the company?

Q. It is addressed to the Appalachian Electric Power Co.

A. That has been stricken out with a pencil.

Q. It was not stricken out before it came from the Commission?

A. No; I do not remember that letter.

Q. Now I desire to produce one more document, headed "Federal Power Commission, Washington, October 28, 1930. Memorandum for the Executive Secretary," and signed "M. C. Tyler, Lt. Col., Corps of Engineers, Chief Engineer," which appears to be a photostatic copy of a document consisting of 11 sheets, and will ask to have it marked "Defendant's Exhibit 541 for identification."

(Said paper is here marked "Defendant's Exhibit 541 for identification.")

Can you identify defendant's Exhibit 541 for identification, as a document in the files of the Federal Power Commission dealing with the Application of the defendant for the Radford project?

A. I remember seeing it.

Q. As I understand it, you have never operated an electric-power system?

A. No.

Q. Did you ever operate a single power station?

A. No.

1685 Q. One moment. That is what you mean when you say how we will operate it?

A. There can be no doubt in my mind or in the mind of anyone else competent to speak of that subject that the Radford project will be a peak load carrying plant in a system of this company.

Q. So it was with full knowledge on your part that the Rad-

ERRATA

Page 1289:

After line 13 from the bottom of the page insert the following: The last six lines from page 1276 and the first seventeen lines from page 1274.

Q. You knew all of that when the license dated May 5, 1931, marked "Exhibit 131," was tendered?

A. I was not with the Federal Power Commission when it was tendered. I observed it after I came there. I have also seen representatives of the Appalachian Electric Power Company frequently in the past five years and never once has there been any suggestion that this plant would be anything except peak load carrying plant in that system.

Q. Has anybody told you that there is going to be some peaking below 9,000 feet?

A. Representatives told the State Commission at Richmond.

Q. I asked you if anyone has told you, any representative or officer of the defendant, that they were going to operate the Radford project peaking from zero to 9,000 through the low season?

A. I don't remember whether they told me that or not.

Q. If anyone ever told you I would like to know who it was and when they told you?

A. Certainly nobody has told me anything other than that. Nothing but what I expect them to tell me, nothing other than that.

By Mr. JACKSON. I move to strike out what the witness would expect.

Q. Let me ask you this question: Is it physically possible to operate the Radford project on a basis involving the passing of the natural flow during low-water periods and peaking that water which is drawn from storage?

1686 A. Yes; the Federal Power Commission tendered a license which would require the licensee to pass that low-water flow, of 580 cubic feet per second.

By Mr. JACKSON. I move to strike out the voluntary statement of the witness as to what the Federal Power Commission did.

Q. Did you understand me to ask you whether the Federal Power Commission had tendered any license requiring the passage of any flow?

A. You did not ask me that.

Q. You know I didn't ask you anything about it?

A. But you asked me something relating to it.

Q. Then why did you volunteer the information?

A. That is pertinent information.

Q. You were not trying to argue the case, were you? You have testified the economic consideration would in your opinion, require operation of the Radford plant on extreme peak-load basis?

A. I did not say extreme peak-load basis.

Q. Let me finish my question. Peak-load basis during low-water season. Do you say that you did not testify to that?

A. I did not say extreme peak lead, but I think I said that part of that time it would be on extreme peak load. I think if it was below extreme peak but somewhere on the peak, they would have those fluctuations in flow just the same.

Q. If you did not mean extreme peaking, from zero to 9,000, during low-water season, what did you mean?

A. I said in every case, whether extreme peak or just below the extreme peak. There are some other small plants, as we know, and you would have fluctuations in flow, and in either of those cases you would shut this plant down, when the flow is down to five or six hundred second-feet, when the rivers below this plant would be in great need of that water.

By Mr. JACKSON. I move to strike out the answer.

By the COURT. Read the question.

(Question read.)

By Mr. JACKSON. Add to the question: What kind of peaking did you assume?

By Mr. GATCHELL. He is adding something to the question that he did not ask before.

A. My reply was in substance, that regardless of whether it was on extreme peak or not, you would have those great fluctuations in flow below the plant.

Q. I move to strike the answer out. I ask you if you
1687 did not assume in speaking of peaking during low-water season, extreme peaking, from zero to 9,000 second-feet or what kind of peaking did you assume?

A. My testimony is that part of the time it might be operated on extreme peak, part of the time it might not be, but in either case, you would have great fluctuation and flow below the dam.

By Mr. JACKSON. I move the Court to strike out the last part of the answer as not responsive to my question.

By the COURT. I will let it stay in.

By Mr. JACKSON. The witness is an intelligent witness but he will not answer my question, and I do not want to take up the time of the Court repeating them all the time.

Q. You tell me now, if you please, what was the range of peaking that you assumed, during low-water season?

A. At times it would be full range of discharge below the dam, ranging from zero flow just below the dam to 9,000 cubic feet per second. At some certain times if you put it on the very peak of the load, the spread might not be quite so wide as from zero to 9,000, but it would be from zero up towards 9,000. I would say from zero to more than 8,000, under most any of those conditions.

Q. I see. Well, you testified, Mr. McWhorter, that there would be week end shut-downs for two or three days—three days, as I understood you, being when a holiday fell on Friday or Monday.

A. I went further than that.

Q. I am not asking you how far you went. Could you answer a question——

A. I did. I think there would be shut-downs for two or three days over the week ends and there would be longer shut-downs.

Q. Suppose we take the one question that I asked you—am I right in understanding your testimony to be that you say that there would be shut-downs of two days over the week ends and three days when a holiday falls on Friday or Monday?

A. Yes, sir; I would say that, if this plant is operated in the usual manner of operating storage power plants—hydroelectric plants, in a system like the system of the Appalachian Electric Power Company carrying general utility loads, this Radford plant would be shut-down over the week end during periods of low flow.

1688 Q. Yes, sir; during periods of low flow. Mr. McWhorter, how many times does a holiday ordinarily fall on Friday or Monday during low-water season in this territory?

A. May 30th, July 4th, and Labor Day will fall on Monday in the same year, and Decoration Day and July 4th will both fall on Friday every time one of them falls on Friday, and the plant would be shut down.

Q. Suppose we take one thing at a time, unless you want to go into it anyhow.

A. I am talking about week ends from late Friday evening until Monday morning.

Q. I have no objection to your going into it, but we can get along faster if you will answer my question. Do you know when the low-water season commences in this territory?

A. Yes, sir.

Q. When?

A. In general——

Q. (Interrupting.) When do you think it commences?

A. Generally we have low water in late summer and early fall.

Q. Do you think that the low-water season commences before Decoration Day?

A. No, sir.

Q. Why so?

A. Because July 4th and Declaration Day fall on the same week day. Labor Day will fall on Monday the same as July 4th falls on Monday.

Q. Labor Day falls on the same day, too?

A. Yes, sir.

Q. Do you think that the low-water season here always starts about the first of July?

A. Not always. We did have some years, I think in 1914, and I believe in 1930, when July was a low-water month.

1689 Q. Wouldn't it be fair to say, as a general rule, that the low-water season in this territory does not start until after July 4th?

A. I say it does not start until after Decoration Day. I think you will find July——

Q. (Interrupting.) More often it will not start until after July 4th?

A. Yes, sir.

Q. It will only be once in seven years, or about twice in seven years, that it will fall on Friday or a Monday?

A. That is about right.

Q. So you think that possibly a Labor Day suspension, or a holiday suspension during low-water season, will be of importance?

A. I was not relying so heavily on that?

Q. You mentioned it.

A. It was a matter of fact that I mentioned, but if you have a plant shut down for two or three days or a week or so, one day is of little importance.

Q. If you were operating the Radford project, would you involve your company in any possible hazard of liability for injuring the rights of riparian owners downstream or interfering with navigation down on the Kanawha River, to save one day's operation of the Radford project?

By Mr. JACKSON. Change that "in order to save one day's operation" and say "to attain one extra days' peaking of the Radford project."

A. My intentions would be probably not to do that, but I will not be here very long and the officers of your corporation in that project will not be here very long, and that project might not be owned by the Appalachian Electric Power Company ten years hence, and the people who feel now that they would not do this might come to some other place and say they will do something else. The people who are operating it now may not

1690 be here thirty years from now. We don't know how it will be operated. They may be expected to operate it in any manner they wish for power alone, and they will do it to bring the largest pecuniary returns to the company. I hope the officials of the company will live to be as old as Methuselah, but we all know that we will not be here indefinitely.

By Mr. JACKSON. I will ask that the question be read:

(The question is read.)

By Mr. GATCHELL. This question goes to whether or not this witness will operate the dam in a particular manner. The question of the bona fides of this company is not involved here.

By the COURT. No, sir; but this witness has stated that this company will operate it in a certain way. He has repeated that time and again, and he has answered the question indicating that belief on his part. They are asking him if he would run the risk of being involved with the United States by affecting navigation and having lawsuits by lower riparian owners in the operation of the plant to save one day. I think it is proper.

A. My intentions might be one thing, but I could not give the assurance that it would be carried out, except in the immediate future.

By Mr. JACKSON:

Q. What would you do? Answer the question and state what you would do.

A. I think I have answered the question.

Q. Is your answer yes or no?

A. I would operate the plant with regard to other interests, at least, that would be my expectations, and I would expect to use that power plant, operating there within reasonable periods, very soon after construction, if allowed to operate for power development alone, but without any restrictions on its operation as to its effect on other interests, I assume it to be operated in a manner that would bring the greatest financial returns to its owners.

Q. If you owned the project and operated it, would you expect that you would soon operate it in order to obtain the greatest returns, without any regard for the rights of lower riparian owners and without regard to the navigation interests on the Kanawha River?

A. If I owned it, I would be in the same position as the people that built it. I would not wait very long——

Q. I will ask that the question be read. (The question is read.) What would you do?

A. If I owned it, my guess is that I would operate it so as to get as much money as I could, but I expect I would soon find myself complained of.

1691 Q. You think that, if you owned it, that you would operate it to make the most money you could and you would not care if it injured down stream riparian owners or the navigation on the Kanawha River?

A. I am talking about the frailty of human nature. That would be the natural thing to expect. If built for power alone,

without any provisions for navigation or the protection of navigation, it will be operated for power and without regard to anything else, and that project has the potentiality of driving navigation off the rivers.

Q. I will ask that the question be read.

(The question is read.)

A. I answered that two or three times. My intentions would be doubtless not to interfere with other people or their rights, but I could give no assurance that that would be carried out for any particular length of time. I might sell the plant after I built it.

Q. You feel that you would sell the plant to people with lesser moral fibre than you?

A. If there were no license and no restrictions of any kind on it, the person buying from me would not expect me to tie him down with things that I was not tied with or with conditions not imposed on me by anybody. I would not be able to sell it if I tried to tell the man I was selling to how to operate it and what he could or could not do.

Q. Do you think that, if you operated that plant and involved your company in lawsuits by downstream riparian owners, and by the United States in connection with navigation on the Kenawha River, that you would hold your job very long?

1692 A. If I were an official, or had an official position with the company, under the conditions involved, I would not expect to build that plant without receiving a license from the Government for that project.

Q. You would feel uncertain of yourself without some governmental restraint upon your pecuniary acquisitiveness?

A. The potentialities for affecting it are too great for anybody to take that risk.

By Mr. JACKSON. I will ask that the question be read.

(The question is read.)

A. I would feel that I was in a better position with the license than without one, and a great many other people feel the same way.

By Mr. JACKSON. I move to strike out from the record how some other people feel.

A. (Continuing.) That is evidenced by the applications filed with the Federal Power Commission over a term of years.

By Mr. JACKSON. We object to that and move to strike it from the record.

By the COURT:

Q. The Commission did extend to the Appalachian Electric Power Company a license, didn't they?

A. Yes, sir; on two occasions—July 1st, 1927, and May 5th, 1931.

Q. And imposed certain restrictions in regard to the discharge of water?

A. Yes, sir; restrictions were recommended originally by the Chief of Engineers or arrived at by consultation with the Chief of Engineers.

Q. And the Company indicated its willingness to accept these conditions in regard to the discharge of water—the most of them?

A. I don't know that it did, Your Honor.

1693 By the COURT:

Q. Isn't that true? Isn't it true that the Government imposed in this license tendered—they suggested certain conditions relating to discharge a required or prescribed amount of water from the dam at regular intervals into the lower stream, and the company, while denying that right to impose these

1694 conditions, indicated that they would accept it?

A. They did not accept the license and I would have to refer to the record.

Q. You have seen the license, have you?

A. I saw the letter they wrote to the Federal Power Commission before I went there, talking about the provisions of license, one at a time, and expressing their willingness as to some of them and expressing their objections and unwillingness as to others.

Q. Didn't they agree in substance with about all of the conditions relating to the discharge of water from the dam?

A. I am sorry I cannot tell the Court right at this moment, but I can find that shortly and will be glad to do so.

Q. Didn't the Company, in its response to the conditions that the Government sought to interpose, very flatly deny the implications that you have given here repeatedly this morning and in your other testimony that they would operate the dam in only one way and that was the only way it could be operated? Haven't they indicated in their response to the Commission just the contrary from your position?

A. If you recall, I did not say that it could not be operated in any other way.

Q. But you have insisted very strongly that they would not operate it only in one way?

A. Yes, sir; I think so.

Q. Didn't they, in their answer, indicate that they would not, and didn't they go far enough with the Commission to indicate that they would not insist on operating the dam in the manner in which you have insisted that they would.

A. They did say something of the kind, but then, in their Declaration of Intention, they made some kind of a statement—

but those documents speak for themselves, of course, and it is very difficult for me to quote what they said or give it in
1695 substance the exact meaning of what they said, but I can refresh my memory in the next hour and tell the Court.

Q. Suppose no license were granted, and in the exercise of their free-handed authority, they decided that they might operate the plant to suit themselves, as you insist they would, what I am getting at—doesn't the course of conduct between the parties heretofore, as evidenced by the conditions that the Government suggested and the response of the Company, indicate its willingness to accept the conditions and indicate that they are willing to operate the plant along lines quite different from those that you insist would be enforced and operated?

A. Your Honor, in all seriousness, my opinion is that, if this project is built, without any restrictions from the Federal Government for its operation, sooner or later, it will cause a great deal of inconvenience and a great deal of adverse effect on the interests of commerce on New River and Kanawha River and the Ohio River, and the potentialities are such that this project can largely drive navigation off the Ohio River.

Q. You say that it was your opinion and conviction that this plant will be operated, as you call it, as a peak load plant all the time, because there was no other way to economically operate it?

A. I beg your pardon.

Q. Hasn't the company indicated by its acceptance of the suggestions of the Commission that they are willing to operate in conformity therewith?

A. They have said in Court and they have said in their Declaration of Intention that they would operate it in some manner so as not to interfere with navigation, but as to my saying that operating at peak load was the only way for it to be operated, I am sure you will see that I said, when there is an abundance of water, the project will be operated on base load; but it will be operated on peak load only in times of moderate flow and
1696 low flow, and at these times, the project will cause this great fluctuation in flows and these periods happen to be critical periods from the viewpoint of navigation.

By Mr. JACKSON:

Q. Mr. McWhorter, you testified on direct examination that, if the Radford project was shut-down for two or three days, or longer, that would render navigation impossible at low water below Marmet Dam. Am I right in assuming that you are referring to navigation on the pools above Locks or Dams No. 6 to 11?

A. Yes, sir; my testimony expressly shows that I said with the Kanawha River, in its present condition, that navigation

would be impossible between Marmet Dam and Wicket Dam No. 11, near the mouth of the River.

Q. You don't have to argue with me every time, Mr. McWhorter? I just want the facts. You refer to Wicket Dams which will be replaced by Winfield and Gallipolis?

A. Yes, sir; I do.

Q. What is a reasonable amount of leakage from a well-constructed wicket dam the size of these dams on the Kanawha River, properly maintained and with proper needling and calking?

By Mr. JACKSON:

Q. Make it dam No. 6—of the size of Dam No. 6, if it will help you.

A. I don't know what leakage is there before the needles are put in, but I do know that, when the Kanawha River is only flowing between eleven and twelve hundred cubic feet a second, and when you take away two-thirds of that at the Radford reservoir, there would not be any water left to operate the power plant and no navigation water left for the operation of the locks and the maintenance of the pools.

By Mr. JACKSON. I move to strike the answer from the records. I asked the witness if he knew—and if he did not, he could say so—if he knew what would be a reasonable amount of leakage through a well-constructed wicket dam the size of Dam No. 6 on Kanawha River, properly maintained and with proper needling and calking.

A. If the Government should go to enough expense in needling and calking, the leakage could be reduced to a very small figure.

Q. Give me that figure.

A. I don't know what it is.

1697 Q. You have been testifying about the dam. What is your judgment about it?

A. I don't know what the leakage is, but I do know that, if you take out two-thirds of that water from a low flow, you could not operate those facilities of the power plants or dams or the locks.

Q. Did I ask you to express an opinion as to what the effect would be? I realize that you will not answer my question, but I hope you will let me ask one.

By Mr. JACKSON:

Q. Why do you volunteer this information when you haven't been asked anything about it?

A. Don't I have a right to answer your question yes or no and then explain it?

Q. Now, that you have given me what you think would follow from cutting off two-thirds of the flow of the Kanawha River, explain your answer as to how much leakage would be through a well-constructed wicked dam, the size of No. 6, with proper needling and calking?

A. It is necessary to take into consideration three things: the leakage of the dam, the water needed for lockage, and the water needed for the operation of the power plant.

By Mr. JACKSON. I move to strike that from the record as not being responsive.

The motion was overruled and the Defendant excepted.

By Mr. JACKSON:

Q. Give your best estimate of what the leakage from Dam No. 6, properly needled and calked and properly constructed—what the leakage would be?

A. I don't know.

Q. Would it be as much as 100 second-feet?

A. I will not guess at it.

Q. You did not arrive at an estimate before when you gave your testimony.

A. That situation is so clear you don't have to go down and go in to the last details of it. It is obvious that, if a private corporation has control of two-thirds of the water flowing in the Kanawha, and the United States only one-third, it would

1698 not operate the facilities in the river.

Q. And you think that determines the leakage from the wicket dam. You testified about the lock in 1930?

A. Yes, sir.

Q. Was there any trouble at Dams 6, 7, 8, 9, 10, and 11, in the year 1930?

A. I heard that there was a great deal of trouble there, and nobody was holding back two-thirds of the water, then, I will remind you of that.

By Mr. JACKSON. We move to strike that statement as being argumentative and unresponsive.

The objection is overruled and the Defendant excepts.

By Mr. JACKSON:

Q. Is it your testimony that there was or was not trouble in the navigation pools on the lower Kanawha River in the latter part of 1930, during low water?

A. It is my testimony that there was general information that the Government had difficulties with navigation on the Kanawha River and Ohio River in 1930 in the low-water period.

Q. Could we get down to one thing and not draw the whole encyclopedia of your knowledge to get an answer? And will you

state whether or not you will testify that there was trouble in maintaining the pool heights on the lower Kanawha River during low water in 1930?

A. I testified that that was my information.

Q. I produce a letter written on the letterhead of the War Department, United States Engineer's Office, 13th Floor, Coal Exchange Building, Huntington, West Virginia, dated October 20, 1931, the subject being: "Pool levels on Kanawha River;" addressed to Mr. F. W. Scheidenhelm, 50 Church Street, New York, N. Y., and signed "United States Engineer Department, by F. B. Duis, Principal Engineer," already identified by Mr. Winn, having identified the signature of Mr. Duis—I mean Mr. Teeter, rather, and marked for identification "Defendant's Exhibit 514," and I read it as follows:

By Mr. GATCHELL. We object to that. They have not introduced it in evidence.

By the COURT. No, sir.

By Mr. JACKSON. He says he has information, and that is all they claim to have that there was trouble, and I want to confront him with the statement and see whether or not it affects his evidence. It is a matter of cross-examination only. The letter reads as follows: "In reply to your letter dated October 16, 1931,"——

By Mr. GATCHELL (interrupting). He is reading a letter that is not in the record. If he wants to introduce it——

By the COURT (interrupting). This is a matter of cross-examination and he wants to contradict him. It may have some effect upon his present testimony. He can do that.

By Mr. JACKSON. The letter reads as follows: "In reply to your letter dated October 16, 1931, regarding difficulties experienced in 1930 in maintaining pool levels above Dams Nos. 2, 3, and 4, on Kanawha River, you are hereby advised that difficulties were experienced in maintaining pool levels above Nos. 2 and 3. However, the deficiency in pool levels was not due to the low discharge in the river, but to missing timbers and stone filling at the tops of the fixed crib dams. After repairs were made, the pools were a little low at times due to leakage through the old crib dams. No particular trouble was experienced in holding pools above movable dams below, though considerable caulking was required to prevent excessive leakage."

Q. State whether or not that shakes your confidence in your opinion that the Government had difficulty in maintaining pool levels above the wicket dams in 1930.

By the COURT. I don't think your question or the letter are proper, Mr. Jackson. I thought the letter had something to do with a previous statement or report of this witness, or at least

indicating some sort of knowledge possessed by him, but what you are doing is, after a witness has made a statement, to ask him if he had knowledge of what somebody else said that was different. I don't think that is the proper practice.

By Mr. JACKSON. I am sorry if it is not the proper practice. It was my understanding, particularly in dealing with an expert witness, that where a witness undertakes to testify about certain conditions, and particularly where he is pretending to give testimony that calls only for general information, that we may bring information from a reliable source, such as engineers—the Chief Engineer in charge of the actual operations, and confront the witness with it, and ask whether or not it affects his testimony.

By the COURT. My recollection is he was asked whether or not they had trouble with the dams on the lower Kanawha and he said they had a great deal of trouble in the summer of 1930.

By Mr. JACKSON. I think he said he had general information about it. But it is not of sufficient importance to stress it.

By Mr. GATCHELL. Do you withdraw it?

By Mr. JACKSON. No, sir.

By the COURT. I will strike the contents of that letter out, and you can reoffer it. It has been identified.

By Mr. JACKSON. We except to the ruling of the Court, for reasons stated.

By the WITNESS. Am I to proceed with my explanation?

By Mr. GATCHELL. No, sir.

By Mr. JACKSON. No, sir.

Q. You have testified, on your direct examination, that, if the Radford plant were shut off for two or three or more days—I mean by that—if the flow were shut off at the Radford plant for two or three or more days, even if the new dams are completed on the Kanawha River, after that, that it would decrease the depths at the upper ends of the pools, above these new pools—these new dams?

A. I did.

Q. That was during low water?

A. Not very low—moderate flows.

1699 Q. Low and moderate flows?

A. Regardless of how low, if you cut it off, it will certainly cause some reduction in the navigable depths in the pools.

Q. Yes, sir.

A. The greater the flow you cut off, the greater reducing effect it will have.

Q. Would it, in your opinion, reduce the level of the upper ends of the pools above these new dams below project depths?

A. It depends on whether or not the project depths are there. These pools, as you brought out so well, with another witness,

the pools progressively silt up, and this cutting off of water, in the first place, will tend to aggravate that condition, and as that silting comes along at the upper ends of the pools, the reduction in the navigable depths will be more and more objectionable.

Q. The normal maintenance of pools is to dredge to maintain the project depths, isn't it?

A. We expect it in natural conditions, but do not expect the United States to bear the cost of dredging under conditions aggravated by the works of private individuals or private companies.

Q. Laying your explanation aside, it is the normal procedure to dredge to maintain project depths, isn't it?

A. Yes, sir.

Q. And dredging is regularly carried on every year, isn't it?

A. More or less regularly, but you may not get to the upper end of a certain pool in time, and if it came down about a foot, or half a foot, your boats are on the ground.

Q. Is there silting during low flow?

A. There is silting at any time the river brings down silt. After rains even during low-water periods, there is considerable silt in New River. The question was raised the other day when another witness was on the witness stand, and said he was up there on Apr. 3, 1936, was up there and the River was
1700 carrying silt. That was questioned. I was on the river April 9th, on the upper part, and in the middle part on April 10th, and downstream on April 11th, and at every place I was on the river at the time it was muddy.

By Mr. JACKSON. I move to strike the volunteered statement, as to the river, because it is not responsive.

The objection is overruled and Defendant excepts.

By Mr. JACKSON. Without waiving my objection, I want to ask the witness a question.

By the COURT. All right.

By Mr. JACKSON:

Q. Were the stream flows raised from rain or any source at that time?

A. The river was in moderate flow. It was not low nor was it in freshet, and we went as far as the mouth of the Gauley River and stopped and viewed the river and took particular note of the line of demarcation—the clear water coming down the Gauley and the muddy water in the New River.

Q. When was this?

A. April 11th of this year.

Q. Going back to the point in your statement of the reduction of the depth of the upper pools—assuming that there is

no silting in the upper end of the pools—say that project depths fully obtained, is it your testimony—it is assumed that the plant would be cut off—two or three days or more, that it would reduce the upper pool—the upper end of the pools above these new dams, below project depths?

A. It is my testimony that it would certainly reduce the navigable depth, and as to your assumption that there wouldn't be any silting, that is not in accordance with the facts. I can assume that if you want me to.

Q. You don't have to assume that, but assume that the project depth obtained in the upper end of the pools; is it your testimony that, assuming it was cut off two or three days, it will reduce the depths at the upper end of the pools above the new dams below the project depths?

A. No; you would have to cut off all water to do that and, of course, you could not cut off all of it. You can cut off enough to reduce it half a foot, or by something over a foot, and that half a foot or foot would be badly needed.

1701 Q. Above project depth?

A. Yes, sir; because when silting takes place to a certain degree, it reduces the depth to less than the project depth.

Q. In assuming the depth was there, then your answer would not follow.

A. If you assume the depth is there, then it is there. That is all there is to it.

Q. The project depth?

A. Yes, sir.

Q. You know what the project depth is, don't you?

A. Oh, yes.

Q. What is the leakage in se ıd-feet in these new dams, like London and Marmet?

A. I don't know, and nobody else knows.

Q. Do you know that the District Engineer has computed that to be 35 second-feet?

A. He has computed that part of it, but that goes through the gates; he has not computed what would go through the foundation or around the abutments, and none of us know that. I wish we did.

Q. It has been testified here, I believe, that the low-water flow at the head of the Kanawha is somewhere about one thousand or eleven-hundred second-feet.

A. The lowest monthly mean flow is about 1,130 cubic feet per second at Kanawha Falls gage.

Q. Would you say that around about 1,100 second-feet would be approximately accurate?

A. Yes, sir; a little above or a little below that during a month like October, 1930.

1702 Q. Mr. McWhorter, what is the fall for 1,000 second-feet of flow in Marmet pool; what is the increment caused at the head of the pool by reason of 1,000 second-feet of flow?

A. It is a very small figure.

Q. The water at the dam being maintained at pool level?

A. Cutting off 1,000 can make a reduction.

Q. Isn't it a fact that with a flow of 1,000 second-feet, that the fall between the upper end of Marmet pool and the dam— in other words, the increment above dead level?

A. Yes, sir.

Q. At the head of the pool would be about one-fifth of an inch?

A. I don't know exactly what, but it would be small.

Q. I show you Plaintiff's Exhibit No. 116 and direct your attention to the back water elevations for 2,000 second-feet—that is, at the head—is that for Marmet pool?

A. Yes, sir—no, sir; this is the head of the Winfield pool.

Q. Yes; that shows 2,000 second-feet and a back water effect of .1 of a foot.

A. It does. Let me explain about that.

Q. Let me ask you this. Am I right in understanding that with 1,000 second-feet, it would on that basis be about one-fifth of an inch?

A. I don't know what it would be for 1,000. It would be less than for 2,000 second-feet, of course.

Q. Is it not in direct ratio to the decrease in flow?

A. My answer would be that it would be less, but I don't know how much.

Q. Don't you know it would be one-fourth?

A. No, sir; I don't know exactly what it would be.

Q. Don't you know, as a hydraulic engineer, the nature of the relationship between back water effects of one and two thousand second-feet?

1703 A. I could guess at it. No engineer knows unless he figures it.

Q. Doesn't it vary in ratio?

A. Any of us can guess and make an intelligent guess.

Q. Would one-fifth in your judgment be an intelligent guess?

A. It would be less than half the effect for twice that flow. I don't know how much less; I could not tell you how much less.

(Exhibit 542 marked for identification.)

By Mr. JACKSON:

Q. Mr. McWhorter, I show you defendant's Exhibit 542 for identification, and ask you whether you can identify that as copy

of a letter in the files of the Federal Power Commission dealing with the application of the defendant for a minor part license?

A. I don't remember it.

Q. Well, when you check these other exhibits for identification, I will ask you to check that also.

A. I have not had time to go over the files carefully, but I understand all of these papers are in the files, and there is a stipulation between counsel that they are in there.

By Mr. JACKSON:

Q. Then you can state all these m rked for identification are in the files?

A. That is my information. You understand, Mr. Jackson, I have not had time since I left here to go over the files, but I am informed that they are all in the files.

Q. Will you check them?

A. If I find anything to the contrary, I will bring it to your attention.

Q. And you will incidentally check for that?

A. What is the date of that?

Q. November 8, 1930.

A. Yes. Before you start, the Court asked me about——

Q. Unless the Court has some inquiry, I would rather go ahead.

1704 The COURT. What is it?

WITNESS. The Court asked me for something, and I told the Court I would be very happy to look it up during the first opportunity, and, during the intermission, I found what purports to be a copy, or rather a somewhat mutilated copy, of the license that was tendered July 1, 1927, to this company. So far as I know, they have the only two copies of the license in existence.

By Mr. JACKSON:

Q. That is already in evidence. The license tendered May 5, 1931, is already in evidence, and Government Exhibit 131——

A. The Court asked me what the company offered to do, and I am trying to show it, and if it is not wanted I have no desire to press it at all.

By Mr. JACKSON.

Q. Mr. McWhorter, we had just finished taking up the matter of your statement that if Radford shut off the flow for two or three or more days it would reduce navigable depth at the upper end of the pools at the new dams like London——

A. I had not finished my answer.

Q. You can answer on redirect, if you want to. You also stated that the impounding of the entire flow of New River for periods

of two or three days or longer, at Radford, would increase the cost of operation of the new navigation dams on Kanawha River, such as London, Marmet, and Winfield; do you recall that?

A. Yes, sir.

Q. And you stated that that increased cost of operation would come about through the necessity of raising and lowering the gate to maintain the pool, I believe?

A. It was my testimony that these gates would have to be manipulated a great deal more than they would under normal conditions.

Q. And don't you know that at low water flow the levels of those pools behind the new dams on Kanawha River, like London, and Marmet, now, and Winfield in the future, are and will be
1705 controlled by the power company through its wheel and not through operation of the gate?

A. They will to some extent. If they are not controlled to suit the Government, the Secretary of War has amply authority to require it to be opened just exactly as it wants it to be opened.

Q. I want to know, as a matter of fact, whether the power company is required to so manipulate its machinery as to maintain the levels of those dams, like Marmet, or pools like Marmet, at the required level?

A. No. The license requires that the licensee, so long as the Secretary of War does not step in and say that this pondage is is required for navigation, the license requires the license to make economic use of that pondage.

Q. Did you understand that there was three-foot pondage on the Marmet pool?

A. No; on the London pool.

Q. I asked you about the Marmet pool.

A. I had the London pool in mind.

Q. Please pay attention to my question and answer accordingly. Don't you know on the Marmet pool the power company is required to vary the hydraulic capacity of its machinery so as to maintain the Marmet pool at the project level, or thereabouts, at low water?

A. Yes, I know that they are not allowed to fluctuate that pool.

Q. And don't you know that the level of the Marmet pool, during low water, is maintained by manipulation of the power wheels and not by the gates on the dam?

A. If you hold the pool stationary at the dam, it does not mean the shutting off of the flow would not cause the surface to drop at the upper end of the pool.

Q. Don't you understand the outlet at the Marmet pool, at low water, is controlled by the hydraulic capacity of the power company and not the lowering of the gates?

A. If it is not controlled by one, it is controlled by the other.

1706 Q. Don't you know that it is controlled by the manipulation of the power?

A. Yes; that is usual.

Q. If you were operating the Marmet dam, would you raise the gates to let low water flow past out of the dam without going through the turbines?

A. You know that license requires the company to make economic use of the water, and the pondage also.

Q. Mr. McWhorter, you do know what the Marmet pool is, don't you?

A. I know the Marmet plant makes use of the London pondage, the same as the London plant.

Q. Do you, or not, know that the level of the Marmet pool, at low water, is controlled by manipulating the hydraulic capacity of the power installation and not by lowering and raising the gates?

A. Yes; it is.

Q. And isn't the expense, if any, of controlling the hydraulic capacity of the power installation an expense of the power company?

A. No; it is not an expense to the power company. It is a great benefit to the power company.

Q. Who does pay the expense, if any, of manipulating the hydraulic capacity of the power installation in the Marmet dam for the purpose of controlling that pool level?

A. Of course the power company bears the cost of operating this plant, but these difficulties that I speak of would come not at extreme low water, but the moderate flow, as I testified just before the recess but did not have a chance to fully answer the question, and that I have not answered it as I wanted to, and you cut me off and said if I answered it at all I would have to answer on direct examination. May I go on?

Q. What question are you talking about? The last question you were asked was what was the back water effect,

1707 and you told me it was very small.

A. A small amount for 1,000 second-feet but I did not get a chance to finish. I will finish now if you will let me.

Q. I think you have answered the question, and I do not know what you want to volunteer.

A. You have only about one-third the information you would have to have to intelligently to understand this difficulty.

Q. You had enough information to understand what the back-water effect was for the thousand feet flow?

A. Certainly, but I have not told you the balance of it.

Q. That is all I ask you.

A. If it is agreeable to you, I will proceed now.

Q. I would rather you would not, because I haven't the slightest idea what you want to volunteer. You are familiar with the fact that the hydraulic installation of Marmet is 9,000 second-feet?

A. Yes; as a matter of fact, I think the engineers did not say it was 9,000 but said it was 8,000; it is my belief it would be about 8,500. There is no use in wasting time in talking about the hydraulic capacity of the plant, because it is somewhere in that neighborhood. I have not answered that question yet, and I would like to answer it.

By the COURT:

Q. Which question is it you want to answer?

A. He is talking about this matter of fluctuation in the flow affecting the expense to the United States operating these dams. I testified that it would increase that expense, and it will, and I would like to be able to put the evidence into my testimony to show that it will.

By Mr. JACKSON:

Q. Mr. McWhorter, is it not a fact that when the roller gates on the Marmet dam are operated, they are raised and lowered by pressing an electric button or switch?

1708 A. They are operated in that way, but somebody must do that. Now, that has to be done particularly at times when the flow down there in the Kanawha River is greater than the hydraulic capacity of the power installation, and there may be times and many times, and for various substantial parts of the time, when the flow up at Radford is around the mean, the average flow which would be in excess of 3,000 cubic feet per second, and at the same time the corresponding average flow down the Kanawha River would be about 13,000 cubic feet per second. To keep varying that flow of 3,000 second-feet, or 4,000, or whatever it may be, would require manipulation of the gates. This power plant at Marmet and the one at London cannot regulate those pools, under such conditions and it would be necessary to keep repeatedly raising and lowering the gates.

Q. Is that all you have to say?

A. That is all I have to say right now.

Q. You do raise and lower the gates by pressing a button, don't you?

A. I don't know whether it is a button, or not. I know that they do it in an easy way.

Q. The power company supplies the current for raising and lowering them?

A. Whatever the license requires.

Q. Do you know the power company does supply current for raising and lowering roller gates?

A. Yes.

Q. Isn't it a fact that there is constantly an attendant at the Marmet dam, or any other dam of the character?

A. I think so.

Q. And isn't it a fact that the attendant has the time to press the buttom occasionally?

A. He may have a good many other duties besides looking out for the gates.

Q. And is'nt it a fact that the Federal Government does not pay the attendant on piece work on account of the number of times that the button is pressed?

1702 A. It is a fact that the Government pays all the men, and it is a fact that the Federal Government has to keep the gates in condition.

Q. You understand what piece work is, don't you?

A. I do.

Q. Don't you know that the Government does not pay the attendant at the dam by piece work for the number of times he pressed the button to raise and lower the gates?

A. My supposition is the same as yours, that they pay these men by the month.

Q. You know that, don't you?

A. I think that is true.

Q. Now, you also gave some testimony as to your opinion of the effect of cutting off all the flow, at Radford, for two or three days or longer, upon the Ohio River, and that testimony is in the record at 3414 and following, you purported to give certain low estimates of flow for the Ohio River above the mouth of the Kanawha. From what, if any, public record did you obtain those flows?

A. I testified where I got them, that I got them from the Army Engineers at Cincinnati.

Q. That is the basis of your statement as to these flows—is what somebody told you in the office of the Army Engineers at Cincinnati?

A. No, sir; not from what somebody told me, but from the Hydrographs and the figures showing the corresponding discharge for those periods.

Q. Will you produce those records?

A. They will be produced.

Q. Will you produce them?

A. I can.

Q. Will you do it at recess, or at some convenient time in the afternoon?

A. Yes; I will.

Q. You also made the statement that at times the flow in the Ohio, and above the mouth of the Kanawha, falls below a thousand second-feet; will you tell me upon what public records you base that statement?

1710

A. I base that upon the same Hydrographs, and I felt that those flows of 1,000 second-feet or less were correct, but I was convinced that that was not the natural flow of the Ohio River. As I explained on direct, there are a large number of Government dams for navigation between Pittsburgh and the mouth of the Kanawha River. I presume that there are 25, because one just above the mouth of the Kanawha is numbered 25. I explained the operation of those dams in the interest of navigation would at times reduce the flow in the Ohio River just above the mouth of the Kanawha to a figure which would be substantially less than what the natural flow of the Ohio River otherwise would be.

Q. When do you think that this flow of less than a thousand second-feet occurred? Give the date, please?

A. One instance of it I would say was between August 24th and August 31, 1918. That is one period, to the best of my recollection, that the flows were about or possibly a little less than a thousand second-feet in the Ohio River just above the mouth of the Kanawha. I can't tell you from memory whether it fell to a thousand second-feet at any other time, but I am sure it fell down to a figure close to that, if not below, at other times.

Q. The only one that you can recollect now is the one from August 24th to August 31?

A. Maybe I can pick it up.

Q. I want you to show me what you know.

A. I have the figures right here. I will not have to wait to go back anywhere to get them. Beginning in the year 1918, these figures show that on July 26th the discharge of the Ohio River above the mouth——

Q. What year?

A. July 26, 1918, the discharge of the Ohio River above the mouth of the Kanawha River was 1,140 Second-feet. On August 27——

1711

Q. Where does that figure come from?

A. These figures, as I have testified, came from the Division Engineer's office in Cincinnati—the Army Engineer.

Q. Supplied to you by that office?

A. Yes. On August 27, 1918, the flow was 1,000 second-feet. All of these flows are on the Ohio River above the mouth of the Kanawha. August 22nd 1,000 second-feet.

Q. What year?

A. All 1918 until I tell you otherwise. August 28th, 1,125 second-feet; August 30th, 1,075 second-feet; August 31, 1,120 second-feet; October 8, 1923, 1,000 second-feet; October 10, 1923, 1,090 second-feet. To show you how that may vary there, on October 9th the flow was 2,040 second-feet, and on October 11th it was again 1,090 second-feet.

Q. What about August 29th you skipped?

A. August 29th, 1918, the flow was 1,160 second-feet; on September 7, 1925, the flow was 1,350 second-feet; September 8, 1,440; September 15, 1925, the flow was 1,030 second-feet, and on September 16th, the next day, the flow was 1,070 second-feet. In the month of August, 1930, there are many flows for the Ohio River immediately above the mouth of the Kanawha ranging from 1,400 second-feet to 1,600 second-feet. Do you want them all read?

Q. Are you speaking for the whole month?

A. The month of August, 1930, I said there were many. The extreme limits are from 1,400 to 3,750.

X Q. Those are all figures you got from the Engineer's Office in Cincinnati?

A. Yes, sir. Now for the month of October 1930, from October 1 to October 15, there are many discharges in there between 1,500 and 1,600 second-feet.

X Q. Quite a little above 1,000 isn't it?

A. Yes; but my testimony is clear about that. During the period beginning with September 19, 1932 on September 19 the flow of the Ohio above the mouth of the Kanawha was 1,000
1712 second-feet; September 20th, 1,000 second-feet; September 21st, 1,000 second-feet; September 22nd, 1,050 second-feet. That is all.

X Q. Are those figures supposed to be estimates of daily averages?

A. Those are estimates of mean daily flow.

X Q. All you know is you got them from the Engineer's office at Cincinnati?

A. Yes, sir.

X Q. Mr. McWhorter, in 1918 don't you know it is a fact there was a good deal of construction work going on on the locks on the upper Ohio river?

A. I know the project was not finished at that time, but it was in 1930.

X Q. Don't you also know there was a good deal of construction work going on in 1923 on those dams?

A. I don't remember just when that project was finished I do know it was finished before 1930.

X Q. You know there was construction work going on in do you not?

A. No; I do not.

X Q. You were talking about this period back in 1918 they have navigation on the Ohio River then, do you know

A. They have had navigation on the Ohio River since pioneers came, so far as I know.

X Q. They had navigation in July and August 1918, d they, October too?

A. I suppose they did.

X Q. You know they did, don't you?

A. I didn't see it, but I have every reason to think they some kind of navigation there. Not as good as they have

X Q. You said you thought there were manipula

1713 of the navigation dams that reduced the actual flow. did you have in mind about that?

A. I testified when these low flows were there, ranging 1,000 to 1,500 second-feet on the Ohio River above the mou the Kanawha River: If you cut off 700 or 800 second-feet of water it would immediately in the river below the mouth o Kanawha cause great difficulties in using the Ohio River navigation.

X Q. I think you misunderstood my question. I will read testimony to you, page 3414:

"Between Pittsburg and the mouth of the Kanawha R are a large number of navigation dams. The exigencies of o tion of these navigation dams, all of which are strictly na tion dams and all of which are operated in the interes navigation, are such that the flow of the river immediately the mouth of Kanawha sometimes falls very materially b what otherwise would be the natural flow of the river at point."

A. Exactly right.

X Q. I am asking what you had in mind as to the mani tions of the dam that resulted in reducing the flow of the River above the Kanawha River below its natural flow?

A. I had this in mind, that the twenty-five navigation d or some number, about that, whatever it is, that even with very best intent of operating all those dams in the intere navigation, even if they were making the best possible effo maintain the natural flow in the vicinity of the mouth of Kanawha there would be times when they would have more natural flow, and other times when it would be less than natural flow. That is exactly what I meant, but it wouldn

practical to operate all those dams so as to just produce the natural flow at the mouth of the Kanawha, and therefore it would have to be either above or below the natural flow, and sometimes I am certain it would be substantially below.

1714 XQ. Mr. McWhorter, are you familiar with the fact that back in 1918 and even after that, there was a practice on the Ohio River of impounding water to create a tide down the river on which were floated barges?

A. That is true, and testimony has been given on that. I knew that a long time ago, but that certainly has not been the practice since the navigation project was completed.

XQ. But it was not complete in 1918?

A. No; it was not.

XQ. Mr. McWhorter, are you familiar with the fact that the low water flow of the Ohio River above the Kanawha has been, or is being augmented by the Clarion River reservoir, Cheat River reservoir, Pymathening reservoir, and the Tygard River reservoir?

A. I knew that certain releases were made at one time or another from one or more of those reservoirs, but to the best of my knowledge and belief those reservoirs except Tygart were all constructed by 1930.

XQ. Isn't the Tygart River reservoir being constructed now for the express purpose of providing an augmented regulated flow on the upper Ohio?

A. That reservoir is being constructed at the expense of the United States, and certainly has not augmented any flow yet.

XQ. But it is being constructed for that purpose, isn't it?

A. Yes, sir.

XQ. Mr. McWhorter will you tell me how much would be a reasonable leakage on a well constructed and designed wicket dam of the size of Dam #25, properly maintained and with proper needling and caulking?

A. I don't know, but I do know that problem of maintaining pools is such that they have difficulty doing it, no matter how much they caulk or how much expense they go to in needling those dams.

XQ. I believe you told me you had never operated such dams?

1715 A. No, sir; but I have gotten this information from Army engineers.

By Mr. JACKSON. I move to strike that answer out as hearsay.

XQ. Of course you never had charge of the Huntington District?

A. No, sir.

X Q. And that District does have charge of the wicket dams on the upper Kanawha and Ohio and for a considerable distance below the mouth of the Kanawha?

A. It has charge of those on the Kanawha. I am unable to say how much of the Ohio it has charge of.

X Q. Colonel Trippe testified at the time he was there it had charge of a considerable part of the Ohio above and below the Kanawha?

A. That is right. It may not be the same now.

X Q. Don't you know it to be a fact that Col. Conklin, Engineer of the United States, has charge of the wicket dams on the Ohio *Ohio* below and above the mouth of the Kanawha?

A. I know he is an engineer officer, but I don't know the extent of his jurisdiction.

X Q. Don't you know it to be a fact immediately before Col. Conklin took charge Fred W. Herman had charge of the wicket dams on the Kanawha and on the Ohio above and below the mouth of the Kanawha?

A. I do.

X Q. And don't you know it to be a fact before Col. Herman, Col. Ardery had charge of the wicket dams on the Kanawha and Ohio immediately below and above the mouth of the Kanawha?

A. I think that is right. I know he was at one time District Engineer there.

X Q. Coming back to my question, which you have not yet answered, will you tell me if you know, and if you do not, will you please so state, what in your opinion would be a reasonable leakage of a properly constructed and designed wicket dam, properly maintained, of the size and character of Dam
1716 #25 on the Ohio River, with proper needling and caulking?

A. My answer is already in the record. I told you I did not know, and went on to explain.

X Q. You don't know?

A. That is right.

X Q. Now don't you in any event know it to be a fact that the dams on the Ohio upstream from the Kanawha require practically the same amount of water to maintain pool levels as the dams on the Ohio below the mouth of the Kanawha, or immediately below the mouth of the Kanawha?

A. I think probably they do require about the same. I know both would be in far better condition if they had much more water during these low flow times instead of several hundred second feet less.

X Q. I show you this publication which Mr. Winn said was the official publication on the Ohio River, issued or compiled under the direction of the Chief of Engineers, U. S. Army and District

Engineer, Cincinnati, Ohio, and direct your attention to pages 151, which shows Dam #25, and 152 which shows Dam #28, and ask you whether or not as an engineer you cannot tell me that dam #25 would require as much water to maintain pool levels as dam #28?

A. Nothing shown here except some profiles on pages 151 and 152.

XQ. I will direct your attention to pages 179 and 182, which appear to show them, page 179 of Lock #25 and 182 of #28, and ask you whether you can't tell me from the profile you showed me that dam #25 would require as much water to maintain pool level as dam #28?

A. Dam #28 would require more, so far as I can tell from looking at these plans.

XQ. Why would it require more?

A. Dam #28 has a navigable pass 700 feet long and chanoin-wicket 296 feet, which is almost 300 feet, making a total of 1,000 feet in round figures.

1717 XQ. 996 feet, isn't it?

A. 996 feet, and #25 has 852 feet in comparison with that. There is that much difference.

XQ. Did you notice Dam #25 has a lift of 8.9 feet and Dam #28 has a lift of only 7.1 feet?

A. I qualified my statement by saying so far as I could tell from what you showed me here on these plans.

XQ. Look at pages 151 and 152, that shows the lift, doesn't it?

A. At Dam #25 the lift appears to be 9 feet and Dam #28 the lift appears to be 7.1 feet.

XQ. The lift is substantially higher in Dam #25 than Dam #28?

A. Wait a minute now. Dam #28 appears to be a higher dam than Dam #25. The lift is more at Dam #25 but Dam #28 appears to be at least as high as Dam #25. I am speaking of the dam and not the lift.

XQ. What is the difference in the lift? I mean by that what is the lift of the two dams?

A. 9 feet at Dam #25 and 7.1 feet at Dam #28, but from my judgment from looking at that profile Dam #28 is fully as high a dam as Dam #25 is.

XQ. You think it is a higher navigation dam with a lower lift?

A. The profile indicates the distance from the foundation to the top of the pool is as great at Dam #28 as at Dam #25.

XQ. You don't believe the figures you see on this?

A. I didn't say I didn't believe those figures. You know I didn't. I said I took those figures from the figures shown on the

pools. No figures on there show the height of the dam, but the profile indicates that #28 is as high as #25.

XQ. In your judgment, as an engineer, what counts, from the standpoint of leakage, the lift of the dam, or the distance from the foundation to the top of the dam?

A. It depends upon where that tail water is held, what the leakage would be.

1718 XQ. Lift means the distance between the water below and the power pool above, doesn't it?

A. Yes, sir; but if something is done to cause the upper end of that pool to drop two or three feet, then the relation is changed between the two.

XQ. That would be abnormal, would it not?

A. Not if you cut off 800 second feet. If you cut off 800 second feet you would get a substantial drop below the mouth of the Kanawha.

XQ. Two or three feet?

A. I should not be at all surprised if it were a couple of feet.

XQ. Let's see about some of those figures of yours.——

A. You can't see about that because you never cut off 800 second feet.

XQ. You say at page 3416 of your testimony that with reference to the effect of cutting off the flow at Radford two or three days, on the Ohio River, in times of extremely low water in the Ohio River, which is a criterion of what we are now talking about, the Ohio River below the Kanawha River needs every foot of water the Kanawha River can supply, and needs more.

A. That is right.

XQ. And then you go on and were asked if you had in mind any particular instances.

A. Yes, sir, and I told you.

XQ. And you said, "I have in mind particularly the ten day period in 1932 and the eight day period in 1918," and after telling about the period in 1932, you said this, "for instance during the eight day period from August 24th to August 31, 1918, the Kanawha River contributed more than three-fourths of the water that flowed in the Ohio immediately below the mouth of the Kanawha River."

A. Yes, sir, it did.

XQ. Will you tell me what was the flow of the Kanawha River, average flow, during the period August 24 to August 31, 1918?

1719 A. Mr. Pierce testified to that, and it is in this record.

You stopped me Friday for mentioning something about what Mr. Pierce testified. He is as fine an expert as there is on that subject, and he determined those flows during this period I

talked about, and which figures are in the record. I can tell you what they are in a minute.

X Q. You, of course, didn't mean to say he said anything about flows in the Ohio?

A. No, sir; but in order to determine the ratio between the Kanawha River flow and Ohio River flow above the mouth of the Kanawha you have to have both sets of figures.

X Q. That is right; if we haven't got both we are in bad shape.

A. We have them though.

X Q. This critical low water period of yours——

A. Just a minute, I am trying to get this for you.

A. (Continuing.) From August 24 to August 31, 1918, the mean flow of the Kanawha River at its mouth was 4,737 cubic feet per second. During the same eight day period, the mean flow of the Ohio River, just above the mouth of the Kanawha River, was 1,207 cubic feet per second, which figures show that during that eight day period the Kanawha River contributed more than 79% of the combined flow of the two streams, just below the mouth of Kanawha River.

Q. And the flow of Kanawha River at that time was almost 5,000 second-feet, was it not?

A. Yes, sir; but what would the Ohio River do without it. You can hold all that passes Radford, you can hold it back.

Q. Do you regard 5,000 second-feet as the extreme low water flow of the Kanawha River?

A. I did not say that. I said the low water flow in the Ohio was the criterion of what we are talking about now. You were getting 1,200 feet in the Ohio and the Kanawha was the bulwark of the Ohio below the mouth of the Kanawha.

1720 Q. Do you think that the flash flow, during low water, of about 5,000 second-feet in the Kanawha River at its mouth, is a fair or typical example of the contribution, in percentage, of the Kanawha River to the flow of the Ohio River, below the mouth of the Kanawha?

A. I think that would be extremely valuable to the Ohio.

Q. Do you think that it would be a fair or typical representation of the proportion of flow below the Kanawha River contributed by the Kanawha River?

A. I want to be fair about it, I want the correct figures in here and that is all I want. I will say this, I do not think it would be very often that the flow of Kanawha River would be four times as much as the flow of the Ohio, as it is in this case, but at such times as it is, the Ohio River needs it very badly, or even when the flow of the Kanawha is equal to the flow of the Ohio River, it needs it.

Q. I suppose you simply mean to state where there is a flood in the Kanawha and none in the Ohio, you can get a higher ratio?

A. I don't think you will find anything about that in my testimony.

Q. You think this example that you gave was the worst, as you call it, or you could not find any worse in the records.

A. Goodness knows it is bad enough.

Q. Do you think it is the worst that you can find in the records?

A. I have not seen any ratio, that has any greater disparity.

Q. Why didn't you give the flow of the Kanawha River, in your direct testimony, of 5,000 second-feet?

A. No such question was asked me. I would just as soon have given it then as now. You know that I demanded that you allow Mr. Pierce to put these figures into the record, and you
1721 would not allow me to testify to them, so I brought them again this afternoon after I had thought about it.

Q. Now take the very same page of your testimony, 3418, you gave the flow at the mouth of the Kanawha for a period of September 15 to September 24th, 1932. Where did you get that from, from the same source, from Mr. Pierce?

A. Exactly, I got the Kanawha flow from Mr. Pierce's testimony in this record.

Q. As I understand your testimony, you felt that my protest restrained you from giving the figure for the Kanawha River in the first illustration, but not in the second illustration. Is that true?

A. I haven't had an opportunity to take that period up, but I am perfectly willing to take that up now.

That shows the Kanawha River contributed substantially less than the Ohio, but at the same time contributed a very substantial part of the total combined flow of the two streams. Those are the low flows.

Q. Your figure of 1,210 second-feet for the Ohio River, for period from August 24 to August 31, was not gotten from Mr. Pierce, was it?

A. No; it was not.

Q. You got no Ohio flow from Mr. Pierce?

A. No; there are no United States Geological survey Gauges on the Ohio River.

Q. They had no means of gauging it, had they? If you get any figures at all, you have to make an estimate of the Ohio River flow?

A. Yes, you have to estimate them from the best information available, the best basis available.

By Mr. JACKSON. I move the Court to strike out all of this evidence because it develops that the witness does not know

anything about that except that he got some information from the U. S. Engineers office.

By the COURT:

Q. Did you say that the geological survey maintains no gauges on the Ohio River?

1722 A. No, the army engineers keep the gages, such as are kept on the Ohio River.

Q. I thought you referred to that record heretofore.

A. I didn't understand you then. The army engineers keep them.

By Mr. JACKSON:

Q. One other question about this August 24th to 31st, 1918 on the Ohio River. Did you observe as Mr. Pierce testified, that the corresponding flow at the Radford dam site was 2,260 second-feet?

A. I don't recall the figure, but that is about half of it.

Q. In your previous illustration you got a figure for that and deducted it. Didn't you do it for this one?

A. Yes; I paid attention to all of that. On that point now, before we get away from that, if they cut off that entire 2,200 second-feet, there certainly cannot be any question to that, as that is nearly half the flow.

Q. Just assuming that somebody ever did that, the flow out of the Kanawha would still be 2,500 second-feet, wouldn't it?

A. Yes, sir; but that wouldn't have been enough water in the Ohio for efficient operation.

Q. That would have been a great deal above low water flow in the Kanawha River, wouldn't it?

A. Yes, it would.

Q. And the natural low water flow——

A. (Interrupting counsel.) I can point out just any number of worse situations than that, if you want to take the time to do it.

Q. This situation that you picked out, the flow at the mouth of Kanawha River, would have been 2½ times the natural low water flow, wouldn't it?

A. No, sir. I did not characterize that as the worst condition. I just simply was casting my eyes over these figures and I picked

1723 them out at random, and I noticed the Ohio was low and the Kanawha was substantially—well, I could give you instances where the Ohio could be affected more adversely than that.

Q. Now you gave some testimony about Bluestone, and I would like to ask you a few questions about that. In one of your answers you said that the Radford project might impound the entire flow of New River for as much as two months, during extreme low water periods, like September to October, 1930. Assuming that

you owned and were operating the Radford project, would you so operate it as to impound the entire low flow of the New River, for the two months period of extreme low water, like September to October, 1930, without regard to injury to lower riparian owners and without regard to effect on navigation in Kanawha River?

A. If I were a licensee under the State of Virginia I think I would do just like what any other licensee would do, and that is, conform to the requirements of that license, but I would not feel obligated to go beyond that and do something else. Moreover, I think I would, at times, shut that power plant down, because it is my information that other plants of this same kind do shut down, and I can give you a particular illustration——

By Mr. JACKSON. One minute, if Your Honor please, I move to strike out the answer of this witness.

A. I know of a situation like this where the dam was shut down 28 different times in six years for periods of from ten to fifteen days at a time.

By Mr. JACKSON. You heard me make a motion to strike out your evidence, didn't you?

By the COURT. I have been right patient with this examination all day long, but it is dragging out. I want the question asked and completed before any answer starts and then I want the answer to the question completed before another question is asked, I do not want the answer interrupted, until it is completed, b. I want the answer to be responsive to the question and no further.

By Mr. JACKSON. May I have a ruling on my motion to strike out this witness' answers?

By the COURT. I did not hear what he said. Both of you were talking at the same time and I was looking at a paper and did not hear what he said. Just read it. (Answer read to court.)

By the COURT. Cut out about the illustrations. He is asking you what you would do if you were in charge of the Radford plant.

A. My recollection is that I said I would operate it in accordance with the State license, if I were a licensee under the State of Virginia, as this compa'y is. I would not feel that I would be obligated to go beyond that.

Q. That is, without regard to the injury to lower riparian owners, or damages suits or the effect on navigation on the Kanawha River.

A. I would operate in accordance with this license, if that is the license I had, and I would expect the State of Virginia to protect me from the Federal Government.

Q. If you were operating this project would you arrange to fill the reservoir during low water seasons?

1724 A. You mean fill it originally?

Q. From year to year?

A. During its operation I would fill it as often as I could.

Q. Isn't it perfectly feasible to fill the reservoir with the run-off, or rather when the run-off is high?

A. Certainly it is, and under this State license you can fill it when the flow is 600 second feet.

Q. That would not be the period of high flow, would it?

A. No, sir. You asked me first if I would fill it at low flow, andI told you I would not, but under the State license, I could.

By Mr. Jackson. I move to strike out his answer as to what could be done under the State license.

Q. Now, Mr. McWhorter, have you made any estimate as to the minimum regulated flow which would be obtained by the use of storage of the Radford project during extreme low water season?

A. In 1930, or a year like 1930, we estimated, in my office, you could regulate if your foresight was as good as your hind sight, you could regulate it so as to have a minimum flow of 1225 second feet.

Q. You would not disagree with the estimates of Mr. Kramer and Col. Watkins, that the regulated flow would be 1230 to 1250 second feet?

A. That is about right. It is all right if you look back on it, at those years, where you figured that could have been, or if anybody could dip into the future and see what the flow would be. I am quite willing to agree that in the future one would be justified in assuming that you would not have a season much worse, if any, than either 1925 or 1930.

Q. You would not quarrel with that result from the application of the rule curve, would you?

A. No, sir.

Q. As far as 1930 is concerned, that would be a reasonable estimate, wouldn't it?

A. It would, if the year was like 1930, that would be about right.

1725 Q. Now historically that is the low water year, isn't it?

A. I have forgotten whether 1925 or 1930 was the extreme low. They were very much the same. The extreme low was 520 in one of those years and 539 in the other.

Q. 1930 was the year that you referred to any way?

A. That is the year that I said you would have about 1,225 second-feet. If you could look ahead as well as you can see back, that may be true.

Q. Does, or does not, the normal operation of a storage reservoir such as would constitute a part of the Radford project, involve entering the low water season with a full reservoir?

A. Certainly we would try to do that, but I don't know whether we could do it all the time or not, but we would certainly try to do it.

Q. That would be the normal operation of any storage reservoir, would it not?

A. That would be the objective.

Q. The objective is normally attained, isn't it?

A. I think it would be.

Q. It would be unreasonable to assume that any reservoir project would begin the low water season with its reservoir partly drawn down, wouldn't it?

A. They certainly wouldn't do it if they could help it, but if the water was not there that would be something over which they had no control.

Q. Is it not a fact that the object is to have the benefit of the utilizable storage available for use in the low water season, or to use it during that time to such extent as may be necessary?

A. That is true, but right there is where the great trouble comes in, and right there is where the main difference comes in between the United States Government, or one of the main difference between the United States Government and Power Company. The Power Company says——

1726 Q. (Interrupting.) You mean the Power Commission when you say Government?

A. Yes; I mean the Power Commission is one agency of the United States; the Department of Justice is another. The Power Company says by constructing this dam we so regulate the flow that the mean flow during low water period ought to be twice as much as the natural extreme low water flow. That statement is 100 percen true, the mean flow is some 1,225 second-feet, and the extreme low natural flow is less than 600 second-feet. When you look, however, and see in the operation of this plant a minimum flow in the New River, below the dam, instead of being 530 second-feet, as the natural flow would be, it could be zero. That is the difference, and that is one of the main points of difficulty between the Government and the Power Company in this case.

Q. The regulated flow would be utilized under peaking, would it not, during the low water season, even under your theory?

A. You utilize in operating a power plant or if the Power Plant would operate as a peak load plant, but now on that point, it reminds me, when you say if it has as much water there as under natural conditions, it is just like saying I will feed a man

four or five times as much as he can eat one week and starve him to death next week, and benefit his condition, and if you reduce the natural flow of the stream from 530 second-feet down to nothing, it certainly does not benefit the reparian owners or navigation.

Q. The Bluestone reservoir has been designed to regulate the flow of New River to a minimum of 2,000 feet during extreme low water seasons, has it not?

A. It is based upon the assumption that 1930 would be as bad a year as we would have.

Q. Can this be accomplished if the Bluestone reservoir were to be drawn down in part prior to the beginning of such low water season?

A. No, sir.

Q. Is it not reasonable to expect that the Radford reservoir would in that respect be operated the same as the Blue-
1727 stone reservoir?

A. No, sir. I would say the Radford reservoir would be operated like the owners wanted to operate it, but during a season like that, you know very well, and I have reason to think, that at times it would move the company to store water for a considerable period of time. You know the reason I think so, which is the result of my experience. If I were allowed to give an illustration I could make it very clear, but I will not attempt to do that, of course.

Q. Just a minute, we are talking about whether or not the reservoir would be drawn before the beginning of the low water season?

A. It might possibly be not entirely full and I think many times it would not be entirely full.

Q. I understood you to say that the regulation at Bluestone could not be accomplished if the Bluestone reservoir were to be drawn down in part prior to the beginning of the low water season?

A. Mr. Jackson, let us get straight on that. My testimony is that in a year like 1930, if the flow of the New River above Bluestone Dam site is not interfered with, and if the Bluestone reservoir starts the low water season with a full reservoir, then that story together with the natural flow would be sufficient to insure an extreme minimum release from the Bluestone Reservoir of 2,000 second-feet per second. If something above, has cut a part of that water off for a part of the time, of course it would not.

Q. That has nothing to do with the question I was asking you. I asked you whether or not the Bluestone reservoir has

been designed to regulate the flow of New River to a minimum of 2,000 second-feet during extreme low water season. I understood you to say yes, for seasons like 1930.

A. With the natural flow of the river coming down.

Q. I will ask you if this can be accomplished if the Bluestone reservoir were to be drawn down in part, prior to the beginning of such low water season, I understood you to say no.

A. My testimony was that it could not be done at all if
1728 the Radford project were holding back the water for a couple of months up there.

By Mr. JACKSON. I move to strike out the answer.

By the COURT. Strike out the latter part of his answer because it was not responsive to the question.

By Mr. JACKSON. Read the question.

(Question read.)

A. I think that is right.

Q. Now I asked you, isn't it reasonable to expect that the Radford reservoir would, in the matter of entering the low water season with a full reservoir, be operated the same as the Bluestone project?

A. No, these projects are entirely different. The Radford project is purely a water power project and the Bluestone project is a navigation and flood control and power project. The Bluestone project is a multiple purpose project but the Radford project is a one-purpose project. I testified three or four times that the objective would be to bring up the reservoir as full as possible at the beginning of the low water season.

Q. You also said there is plenty of water to fill the Radford reservoir.

A. You might call it up at the top in a certain date, in the early summer or spring.

Q. It is just as feasible for the Radford reservoir to be able to enter the low water period with a full reservoir as it is for the Bluestone, is it not?

A. They are operated for entirely different purposes.

Q. But you said the objective of any reservoir for power purposes would be to enter the low water season with a full reservoir?

A. Yes.

Q. Then is it not just as feasible for the Radford project to attain that objective as it is for the Bluestone?

A. Perhaps so.

Q. You know so, don't you?

A. I know, that is right.

Q. Now you have already stated on your direct examination and again on your cross-examination, I think, that the

729 Bluestone reservoir has been designed to regulate the flow of New River, so that there would be a minimum regulated ow of 2,000 second-feet, at least under conditions no worse han 1930, with no interference with the flow?

A. That is right, with emphasis on that last.

Q. In that design has the Bluestone reservoir been in way dependent upon utilization of storage of the Radford reservoir?

A. I don't know.

Q. Do you know whether or not the Bluestone reservoir in rder to produce 2,000 minimum flow during extreme low water. elies upon any augmenting of the low water flow by the Radford roject?

A. I did not design the Bluestone project, I haven't had anyhing to do with it, and the Federal Power Commission has not nything to do with it since the Government has been interested n it. I can tell you what my understanding is.

Q. You testified, I think, on your direct examination that you ere familiar with the plans of Bluestone?

A. I did.

Q. And they appear in Government Exhibit 145, don't they? House Document 191?

A. The only plans I am familiar with are the plans referred o in the so-called 308 report, Supplemental Report on the Bluestone project, they are the only plans I have any familiarity with t all, and I have no information whether those plans have been odified since that time, or not.

Q. Didn't you study this document, Government Exhibit 145, losely enough to be able to say that the regulated flow does not epend upon any storage at Radford?

A. I don't know whether it does or not.

Q. If you do find anything in Exhibit 145 that would indicate hat that regulated flow of 2,000 second-feet during extreme low water at Radford, does do so, will you let me know?

730 A. Certainly I will be glad to, but as I have testified. if Radford is holding it back rather than sending it along, hey would not have it.

By Mr. JACKSON. I move to strike out the answer as not esponsive to the question.

Q. Assuming that the Bluestone project does not depend on ny storage at Radford, with 2,000 second-feet regulated flow, hat is, it does not depend on augmenting the low water flow of hat storage, and assuming that during the low water season uch as 1930, the Radford reservoir outflow were to be cut off, nd Radford project storing water that condition could not reasonably exist unless there had previously been some drawdown

of the storage during low water season, could it, that is, the Radford storage I mean?

A. No, assuming the reservoir was full at the beginning.

Q. At least, if the Radford reservoir had obtained its objective of being full at the low water season, and subsequently storing during low water season, it would mean there were some drawdown of the low water during that season?

A. That is right.

Q. Is it not a fact under such circumstances Bluestone would have the benefit of all stored water released by the Radford project?

A. Yes, sir; it would.

Q. Would not that mean that the operator of the Bluestone project would thereby have been able to conserve the water stored in the Bluestone reservoir?

A. He would, but that would not necessarily mean, or that doesn't follow that the storage of water at Radford, any time the owner might choose to store it, could not adversely affect Bluestone.

Q. I was just asking you for an answer to this particular question, and I do not want to argue a collateral point with you, that is, under these assumptions, the Bluestone operator because of the stored water coming down from Radford, which could be passed on down the stream, would be enabled to use that water in lieu of the Bluestone storage.

1731 A. If your assumptions and your statement that the Radford reservoir would be entirely full and then they would draw that storage out, were to be taken as facts, the Bluestone would have the benefit of such storage as may have been drawn down.

Q. And under those assumptions unless the Bluestone operator chose to waste the water stored from Radford, he could enter the latter part of the low water season with more water in the Bluestone reservoir than is necessary to maintain a regulated 2,000 second foot flow during the balance of the low water season?

A. That all depends on what is sent down there.

Q. If he had his reservoir full to start the season and if he has had the benefit in the meantime of the Radford storage, he would have left more than enough under the conditions for which the reservoir was designed, to maintain a 2,000 second feet regulated flow for the balance of the season?

A. If the Radford reservoir is operated primarily to increase the flow below rather than primarily as a power project, then it could benefit the Bluestone project. On the other hand, under certain other conditions, as I have testified, it could be a detriment to the Bluestone project, and not only render it impossible for

the Government to provide that 2,000 second feet but it would reduce the prime power at the Bluestone project.

By Mr. JACKSON. I move the Court to strike out the voluntary statement of the witness.

Q. Am I not correct in saying that to the extent that the Radford project reaches the end of low water season, with the reservoir drawn down in whole or in part, to that extent the Bluestone project will have been enabled to maintain a regulated flow of more than 2,000 second-feet during low water season?

A. That is true, if they do that, but if before the end of the season they start storing and store every bit of the water for a month or more, it is not true.

Q. Now Mr. McWhorter, if the operator of the Bluestone project utilized the storage of Radford project, would not that produce more power at Bluestone?

1732 A. Yes; it would produce more kilowatt hours, but if the shutting down of the Radford plant was such as to reduce that minimum flow, after certain other water supplies from Radford had necessarily been discharged down at Bluestone, to prevent encroaching upon the flood storage space, the prime capacity of Bluestone would be reduced and that is the important thing, and the investment there would be seriously affected.

Q. Now I thought we had been all over that once, but I will just ask you to make an assumption. Assuming that the Radford project entered the low water season with a full reservoir, and assuming that sometime during the course of low water season, the Radford storage were let down into Bluestone, in whole or in part, would not that necessarily increase the amount of power which could be produced by Bluestone during low water season?

A. I think I have answered that would increase the number of kilowatt hours. The Bluestone project, they cannot hold any water in the reservoir above a certain elevation because there is a very substantial draw-down there reserved for flood storage.

Q. Mr. McWhorter, is it your anticipation that the Bluestone reservoir will be filled throughout the low water season?

A. No.

C. If the Bluestone reservoir is not filled, will it not be able to hold the Radford storage as it is let down?

A. It would, but Mr. Jackson, you have assumed, or rather, you are trying to prove that we have assumed that these projects will be operated just alike, and I have testified before that they will not be operated alike, because Bluestone is a combination navigation, flood control and power project, whereas Radford is purely a power project.

Q. Mr. McWhorter, from the standpoint of power production, assume that the Radford reservoir enters low water season

1733 full and during the low water season lets down most of
storage, will not that stored water be available for the u
power, or production of power rather at Bluestone, regardless
whether Radford is operated, on daily peak or otherwise?

A. Yes, sir; that water will be available at Bluestone for t
production of energy, but it does not follow from that that t
prime capacity at Bluestone would not be reduced.

Q. Let me ask you another question. Assuming that Radfo
entered the low water season with a full reservoir, and duri
the low water season lets down all or substantially all of t
storage, will not that increase the prime power capacity
Bluestone?

A. It would.

Q. Assuming that Bluestone reservoir is in operation, isn't
a fact that any daily fluctuations from peak load operations
Radford could not have any effect down stream below Bluesto
upon the flow—the variations in flow?

A. I think that is right.

Q. What did you say was the drainage area of New Riv
at its mouth?

A. The drainage area of New River at its mouth?

Q. Yes, sir.

A. I did not give that; I think it is——

Q. Will you give it?

A. I think it is—I better look it up—it is 6,900, I think. Le
see.

Q. Couldn't you get that for us quickly?

A. I think so; 6,918 is proper; I will have to verify that.
said 6,918—it is 6,941.

Q. It is 6,941?

A. Yes, sir.

Q. For September 1932, what was your estimate of the me
flow above Radford dam site?

A. In September 1932?

Q. Yes, sir.

1734 A. I don't remember; I will have to look it up. (Wi
ness produces papers.) Did I testify to that yesterday?

Q. According to the record, page 2441, you say 1,220 secon
feet?

A. I have no reason to think that it is any different from tha

Q. How did you find that?

A. What year.

Q. In September 1932?

A. September 1932—we took the published flow of New Riv
at Allisonia and at Eggleston, and we estimated the average di
charge of Little River at its mouth by using the flow at Grayso

ton a few miles above on Little River, a few miles above the mouth, and increased that in accordance with the proportional drainage area at the mouth and at the Graysonton gage.

Q. When——

A. (Continuing.) Then we deducted from the flow at Eggleston, the flow of Little River, and we deducted from the drainage area at Eggleston, the drainage area of Little River, and then, from the remaining flow at Eggleston, and the observed flow at Allisonia, I interpolated the flow at the Radford dam site on the basis of the proportional drainage areas.

Q. All I wanted was the estimated flow?

A. Yes, sir; it is a very satisfactory estimate, I take it.

Q. Have you compared the United States Geological Survey estimates of stream flow at Hinton, the Pack's Ferry gage on New River and the one at Alderson on the Greenbrier River, with like estimates for the New River at its mouth, for the month of September 1932?

A. I may have; I don't remember now; I worked on this from time to time, a good many times.

Q. Look at Water Supply Paper 728, page 95, and tell me whether the flow for September is there estimated at Hinton
1785 as 1,180 second-feet average for September 1932?

A. It appears to be 1,180 second-feet.

Q. And at the same time, notice if the drainage area is 4,560 square miles?

A. 4,560? [Witness examines papers.]

Q. Make a note of those figures, please, and turn to page 113 of the same Water Supply Paper and state whether or not the flow at Alderson on the Greenbrier River is 89 second-feet, the average flow for September 1932?

A. (Examines paper.) 89.4 second-feet.

Q. Well, call it 89 or 90, whichever you wish; but please take that down.

A. All right, call it 89.

Q. What is the drainage area at Alderson on the Greenbrier river—1,349?

A. Yes, sir.

Q. State whether the combined drainage areas and run-offs at this point would be 5,900 square miles and 1,269 second-feet?

A. That is right. Wait a minute—the first one was Hinton?

Q. Yes.

A. The Hinton gage—is that at Pack's Ferry?

Q. I think it is given there [indicating book being examined by witness].

A. Yes, sir; two miles above on the Greenbrier river.

Q. Now, that estimate of 1,269 second-feet or 1,270, whichever you use with Alderson, compares with your estimate for New River at its mouth of 1,270 second-feet?

A. 1,270.

Q. Yes, sir.

A. I said about 1,270.

Q. Yes; now, what of——

A. In 1932?

Q. The point is——

1736 A. (Interrupting.) That 1,270 is the flow—the published flow at Caperton gage, probably a little more—not much more than at the mouth of the river. At certain times of low flows—there is extremely little inflow in that part of the river. I gave figures to show—that did show the times the inflow was almost negligible.

Q. The point is—your drainage area at the mouth of New River is 6,941 square miles, is it?

A. Yes, sir.

Q. And we have your estimated flow at 1,270 second-feet?

A. I took the actual flow published by the Geological Survey at Caperton and I said that the flow at the mouth was about that.

Q. That is the estimated flow of the Geological Survey?

A. That is the flow they determined at the gaging station and published it.

Q. The Water Supply Paper No. 728 shows the same flow substantially, 1,269, in comparison with 1,270, for a drainage area of only 5,900 square miles?

A. Yes, sir; it shows the same at the head of the reach at Hinton.

Very little water comes in there. As you will recall, I showed you Friday that for that drainage area of 12,200 square miles at the mouth—we compared the 8,367 at Kanawha Falls for the entire month of October 1930, and the discharge at the mouth of the river of 1,150 second-feet, and 1,130 at the Kanawha Falls, meaning that it practically showed that there was practically no increase in almost 4,000 square miles of the drainage area of the river; but that above Radford dam site, where there is a substantial yield of water during low flow periods, you find a different situation.

Q. All of these things——

A. (Interrupting.) I do not mean, however—I do not mean to say that at any place on this river or on any other river where the Geological Survey, or any other agency, published the

1737 flows, that you will not find an occasional inconsistency, but these things in general certainly do not tend to break my confidence in these records. To illustrate, on a previous day,

a question came up about the flow at Kanawha Falls being less for one day than the flow at Caperton. The fact that the Geological Survey showed it less, increases my confidence in their report. If they had gotten busy and had tried to show that the flow was bigger there, they would not have given the correct answer and their records would not be as valuable. There was a reason for that variation and that reason was brought out and shown here. The Geological Survey people publish records of a great many streams and these records are reliable and dependable. They are used by the Power Companies all over the country and the Power Companies have confidence in them, and the Government agencies, including the Federal Power Commission, have great confidence in them, and the Appalachian Electric Power Company itself, I think, in them—it has enough confidence to spend Millions of Dollars, basing the economics of their projects on them, and to propose to spend Ten Million Dollars more, on occasional inconsistency—apparent inconsistency—in the records, or an inconsistency that you cannot explain, certainly does not tend to discredit these records. It does not affect their substantial value.

Q. Have you finished?

A. Yes, sir.

Q. Will you tell me whether or not, whatever the cause may be, your estimate does not show the same flow for New River for September 1932, as is shown by the gages for Hinton and Alderson, although the drainage area at the mouth of New River is 118% of the drainage area at Hinton and Alderson?

A. You mean 18% greater?

Q. 118.

A. It is 5,900 at Hinton.

Q. Yes, sir; and this is 6,941.

1738 A. That would not be 118%. It might be 18%. I showed you a moment ago, that further down stream, you have increased drainage area almost 50%, with very little increase in flow.

Q. These are all estimated flows?

A. Yes, sir; but they are mighty good. You cannot get around them.

Q. You gave the mean flow of the Kanawha River at its mouth as 1,660 cubic feet per second; I believe you gave that in the record at page 3448?

A. What month is that?

Q. That is——

A. This last example at Hinton and the mouth of the river—I do not see any difficulty about that at all. Those flows are the same but there is no considerable difficulty about that. You would

expect it to be a little more at the mouth but not substantially more after the flow gets that low.

Q. I will ask you another question—on page 3448 of the record you say that during the entire six months period from June 1st to November 30, 1930, the mean flow of the Kanawha River, at its mouth, was 1,660 second-feet?

A. Yes, sir.

Q. How did you estimate that?

A. I estimated that just exactly like Mr. Pierce estimated his figures at the mouth of the river. I conceded—I recognized, at least, that the experts of the Geological Survey are better experts on that subject than I am, or anybody else connected with the Federal Power Commission, and so I discussed that with Mr. Pierce, and had members of my staff discuss it with him, the exact practice that he used in estimateing the flow at the mouth of the river, and this I used.

Q. What did you do. I do want what Mr. Pierce did, but what you did?

A. First I observed the flows—the mean flows each month
1739 at the Kanawha Falls gage, and then took into consideration that there were three tributaries of ordinary or substantial size between the Kanawha Falls and the mouth of the river—two of these tributaries on the right bank—one of the Elk River and the Pocatello and the other the Cole River, from the left bank. We observed the flows—the corresponding flows of those streams for the corresponding monthly periods, and noted the drainage area of each flow is those smaller basins, and then, in order to get the most accurage results possible, we allocated the remaining drainage area below the mouth of Kanawha Falls gage to these three separate drainage areas below, and then, on that basis, estimated the increase in flow in each one of these tributaries, in proportion to the amount of the allocations of the drainage areas in these basins, and in that way we estimated the flow there at the mouth of the river during that six months period would be 1,660 second-feet, or as compared with 1,590 second-feet at the Kanawha Falls gage.

Now, the corresponding estimate for the month of October is 1,130 at the Kanawha Falls gage and 1,150 second-feet at the mouth of the river. If there is any better way to do that, I would like to know it. That is the best way I know to do it.

Q. There is no gage reading of the other tributaries in 1930—I mean 1932, is there?

A. This was 1930, June to November 1930.

Q. Yes, I beg your pardon. You gave in your testimony a good many figures on certain stream flows, I believe, did you?

A. Yes, sir.

Q. These were all estimated in somewhat similar fashion, from such data as was available?

A. The basis of these figures was the published flows in the Water Supply Papers of the Geological Survey and the drainage areas determined by the Survey, and in many cases, we simply took the published flow direct from the records and used them. Where necessary, as for instance in estimating the flow at Radford or at the mouth of the river, we did as I have told you.

1740 Q. And you took some of the flows from Mr. Pierce?

A. Mr. Pierce had testified as to some flows and I took his figures to be correct.

Q. And in other cases, you have some from the Cincinnati Engineering office?

A. Those in the Ohio River we got from the Division Engineers' office in Cincinnati.

Redirect examination by Mr. GATCHELL:

Q. There has been some little question as to whether or not the company had applied for a Major or a Minor License, and I show you Government's Exhibit No. 90, and ask you to read the first part of that paper (handing to witness)?

A. All right. (Reading): "The Appalachian Electric Power Company—Application to the Federal Power Commission for a license under Act of June 10th, 1920, for the development No. 6, New River, a Major project in the State of Virginia."

Q. And was that the application for this particular project?

A. Yes, sir.

By Mr. JACKSON:

Q. What is the number?

A. It is Number 90.

By Mr. GATCHELL:

Q. If the Bluestone project should be constructed as proposed and operated as set forth approximately in Government's Exhibit No. 145, being House Document No. 91, and if the Bluestone reservoir is filled except for that space reserved for flood control, would there be any place to store additional water coming into the reservoir from above?

A. No.

1741 Q. If, under such circumstances, the Radford project should be operated, as you have said it may be, as a peak-load plant, would there be any space to store the water in the Bluestone reservoir?

A. There would not be any place to store it as long as the Bluestone reservoir is full—up to the lower limit of the flood control—of the space reserved for flood control.

Q. Would it be to the economic advantage of the owner o the Radford project to empty and fill that reservoir as frequentl as possible during high water?

A. During high water, once they got the reservoir full, if th discharge is more than 9,000 second-feet, it would remain ful and there would not be any filling and emptying of it.

Q. During the times of discharge—during the times of flow in New River at the Radford dam site, of less than 9,000 second feet, would it be the usual practice to operate this reservoir a its full capacity, or would the discharge be sent through withou any ponding?

A. The plant would be operated at full capacity for part o the day, but could not be operated at full capacity for the entir day, without progressively drawing down the reservoir.

Q. At what stream flows on the Kanawha River would be— would it be necessary to operate the roller gates at the London Marmet and the Winfield dams?

A. It would certainly be necessary to operate the gates at al times when the flow of Kanawha River exceeds the hydrauli capacity of the power plants,—that is, exceeds the combine amount of water used—by the plants, the locks, and as the resul of leakage.

Q. You spoke this morning of stopping the flow of one thou sand second feet down at Kanawha Falls as possibly lowering the back water elevation as a small fraction of a foot?

A. Yes, sir.

Q. Would there be any other flows at Kanawha Falls
1742 or below which would be more important than 1,000 second feet discharge?

A. From that particular viewpoint, the higher flows at Rad ford—I mean, now flows ranging about the average between zero flow and the capacity of the installation, between 4,000 and 5,00 cubic feet per second—the holding back of these flows would have a substantial effect upon the surface elevation at the upper ends of the Gallipolis and Winfield and Marmet pools. If at a time when the flow in the Kanawha River is 10,000 cubic feet per second, the operation of the Radford project should reduce that flow by 4,000 cubic feet per second, the elevation of the water surface in the Gallipolis and Winfield pools would be reduced at the upper ends of these pools, about .8 of a foot in one of them and about 1.1 feet in the other.

Q. Mr. McWhorter, if you were engineer in charge of the operation of the Radford dam, and the Buck and Byllesby plants of the Appalachian Electric Power Company, and knew that there was a state license under which the Radford plant could operate

and no federal license had been imposed, in what manner would you operate the Radford plant during the times of low water?

A. I have already testified on cross-examination that if I had a State license I would observe the terms of that license but I would not feel obligated to do anything more, and I would, under those circumstances, operate the Radford project to the best advantage to me and my company without violating any terms of the State license. In doing so, I would, if that method of operation caused these great fluctuations in flow from zero to 9,000 second-feet below the dam.

Q. If it was necessary, would you store the water in the reservoir in low water times?

A. Yes, sir.

Q. During low water times, under such manner by you as the engineer in charge, would it be economically advantageous for you to store the water?

1743 A. It would at times, and I would store it, but I would store it in such manner as not to violate the terms of the State license.

By the COURT:

Q. Would you do that at the risk of having the Federal Government come along and remove that very valuable investment?

A. Yes, sir; and I would expect the State of Virginia to protect me as long as I did not violate the terms of the license that the State had given me, and I think that is what anybody else would do.

Recross-examination by Mr. JACKSON:

Q. As I understand you, Mr. McWhorter, if you were operating the Radford project, you would not violate the State law, but you would the Federal law; is that right?

A. No.

Q. Did you observe, when you read the license, that it states that the licensee shall operate its project so as not to interfere with the navigable capacity of any navigable water?

A. Yes, and it goes ahead right after that and gives the licensee the right to operate the project just about any way it wants to, so far as the release of water is concerned.

Q. You state that if there were a flow of 10,000 second-feet in the Kanawha River, and it were reduced to 4,000——

A. (Interposing.) No, reduced by 4,000 down to 6,000.

Q. (Continuing)—it would cause the reduction in elevation or back water effect at the upper end of the pools of the Kanawha River, and you gave the figures?

A. Yes.

1744 Q. Would the water surface still be above the proje
depth?

A. It would, but the depth might not be the project depth?

Q. It might be filled in, of course. All right, that is all.

Mr. THOMPSON. If the Court please, at this time I would li
to offer in evidence the remaining part of Government Exhibit 9

Government Exhibit 91 was limited, at the time, to the first tw
reports [6th and 7th Annual Reports] of the Federal Power Co
mission. Under the same cover there was also the 8th Annu
Report, the 11th Annual Report and the 12th Annual Report.

These reports are the only ones which cover anything with re
erence to the project of the Appalachian Electric Power Compan
and, at this time, I desire to offer in evidence the remaining r
ports covering this subject, under this cover and under this E
hibit 91.

Mr. JACKSON. If your Honor please, I want to say that I thin
counsel is mistaken in saying that these are all annual repor
with reference to the project. I mean these and those previous
offered. They are not, I think, the only ones. We concede th
authenticity of 8th to 11th Annual Reports.

Mr. THOMPSON. And the 12th?

Mr. JACKSON. And have no objection other than to their rel
vancy or competency to prove the facts which may be recited i
them, which I have not carefully read.

As to the 12th Annual Report, we object to its competency fo
any purpose, for the reason that if proper proof were made i
would appear that the quotations from the 12th Annual Repo
relate to the famous Columbus Day meeting of the then Feder
Power Commission, which met on November 12, 1932, and not i
the regular course of business,—not for consideration of thi
project, but in the midst of a law suit against these defendant
It gathered in Washington and undertook to pass a resolutio
spreading upon the minutes of the Federal Power Commissio
such information as they thought appropriate to guide the Cou
in deciding the case then before it.

We think any such action of Government representatives, a
individuals, cannot be said to be in the regular course of Gov
ernment business, nor can it have any relevancy.

As to that, the excerpt from the 12th Annual Report, appea
ing in Exhibit 91, we object not only as to its relevancy an
competency, but as a self-serving and self-promulgated documen

Mr. THOMPSON. They were not as individuals before this Cour
That is what counsel attempted to make them in the entire cas
and the Court threw them out, and that is one of the grounds o
which a reversal came from the Circuit Court of Appeals.

He speaks about the regular course of business: I think the Court will take judicial notice that all meetings of members of a Government board transact business. Furthermore, the statement that is in the record here is by a new Commission and not by its predecessor, and we think also the Court can take judicial notice that no Commission is controlled by decisions of its predecessor.

All I am offering this for is as a record of the Commission. The Court may say that it has no value, after considering it, but I am offering it as a public record and public document.

Mr. JACKSON. We submit that officers of the Federal Government cannot make evidence in a suit pending against them by meeting together and passing resolutions and undertaking to decide an issue before this Court,—which is just what these gentlemen did in their resolution after the previous case had been argued and submitted to Mr. Justice Way, and we think it has no competency whatever in this record. To my mind it is a highly inappropriate thing for federal officials to try to get before the Court resolutions undertaking to state upon what facts the Court should undertake to decide this case.

The COURT. I think I will admit it in evidence for the reason that I want before me a record of everything that was done. What weight I will give to it, it is entirely possible I may have the same view you have and it may not be. That goes to the weight I would give to the action of the Commission. But I want before me in this case, which is a novel one, everything which does not fall within well established precedents, and I want everything done by the Commission relative to this subject.

Mr. JACKSON. I fully appreciate the position of the Court. I do not want to be captious in asking for formal proof of the things that I know are accurate statements of what was attempted to be done. The situation that does disturb me is this: I am certain if the Government were required to make formal proof of this meeting, on cross-examination of anyone competent to prove it, he would say it was a meeting called and held in the course of the previous litigation in an attempt to bolster up what they conceded to be the weakness in their case then pending—not in regular course. If it goes in under this kind of showing, there is no opportunity to bring it out, but it appears on the face of the resolution that it is not described as they referred to it in briefs and arguments.

The COURT. I have just glanced at it, and it appears that it was held during the pendency of that suit.

Mr. THOMPSON. I don't know whether the meeting was held for that purpose, or not, but whether held for that purpose,

there was a good reason. If you will take the briefs, counsel said this Commission was reaffirming what a previous Commission has said, and that was put before Judge Way in open court.

Mr. JACKSON. It went in at your request.

Mr. THOMPSON. Yes.

Mr. JACKSON. We concede that it is an accurate copy of the resolution that these gentlemen attempted to pass, and we think it improper to spread it upon the minutes of the Federal Power Commission. The only matters argued before Judge Way were the actual resolutions that appeared, and they speak for themselves, and counsel for the defendant was unhappy with the way that they were quoted.

Mr. THOMPSON. We were very unhappy over the way that they tried to change language. The Commission was outraged, I may say to the Court.

The COURT. Go ahead.

Mr. JACKSON. May our exception be noted to the reception of the excerpts from the Annual Reports of the Federal Power Commission, 8th, 11th, and 12th Annual Reports, insofar as they are included in Government Exhibit No. 91, for the reasons already stated.

The COURT. Yes.

1745 JAMES W. JOHNSON

Direct examination by Mr THOMPSON:

Q. Mr. Johnson, will you please state your name and residence to the Reporter?

A. James W. Johnson; Florence, Alabama.

Q. What is your occupation, Mr. Johnson?

A. I am an engineer.

Q. What schooling and experience have you had as an engineer?

A. I was prepared for college at Trinity Park Preparatory School, Durham, North Carolina. I graduated with the degree of Bachelor of Engineering from the North Carolina State College of Agriculture and Engineering in 1913. I entered the graduate students engineering course, at the Lynn, Massachusetts, Works of the General Electric Company in June 1913, and completed the course in August 1915.

Q. Mr. Johnson, what positions have you held since your graduation from college in your profession?

A. From August 1915 to January 1917, I was in the emplcy of Seymour Manufacturing Company, Seymour, Connecticut, as plant electrical engineer, in charge of design, construction, and maintenance of the plant electrical equipment.

From January 1917 to April 1918, I was employed as assistant to district superintendent Naugatuck-Seymour district of the Connecticut Light and Power Company. The duties consisted of supervision of operation and maintenance of transmission and distribution lines in several municipalities within this district.

From April 1918 to February 1921, I was in the employ of the Kerite Insulating Wire and Cable Company, Seymour, Connecticut, as plant electrical engineer, in charge of design, construction, and maintenance of the plant electrical equipment, including a power plant.

By Mr. JACKSON:

Q. Was it a steam plant?

A. It was steam, supplemented with hydro. It was a small hydro installation.

1746 From May 1921 to July 1922, in the United States Navy Yard, Norfolk, Virginia, engaged in electrical design and testing of power equipment aboard ship.

July 1922 to September 1923, Chief Electrical Engineer with the Sheffield Company, Sheffield, Alabama, a public utility company, which operated a steam generating plant, street railways and electric distribution system in the municipalities of Florence, Sheffield, Tuscumbia, Alabama.

From November 1923 to April 1926, in the employ Hugh L. Cooper and Company, Incorporated, Consulting Engineers, who were, during the time, engaged as consulting engineers upon the Wilson dam, the hydroelectric plant at Florence, Alabama.

My first assignment with the Cooper organization, on the Wilson dam project was in the design office. When the design of the project was approximately completed, I was appointed assistant operating superintendent, and in this capacity I first assisted in the forming of an operating personnel and in the starting up of the hydroelectric plant, which was then the largest in the world. I may say I supervised the functional tests, the acceptance tests and the efficiency tests incidental to the placing in operation of this plant.

After operations were begun, among other duties I kept records of gaging stations and flows on the Tennessee River from Hales-bar, Tennessee, to Florence, Alabama, which included a reach of the Tennessee River of about 175 miles.

From April 1926 to March 1930, I was in the employ of the War Department Corps of Engineers as Assistant Operating Superintendent of the Wilson dam hydroelectric plant. This was a continuation of the position began while with Hugh L. Cooper & Company. I transferred to the War Department when the Cooper Company terminated their contract.

I continued to keep gaging station and stream flow records after my transfer to the War Department.

1747 From March 1930, to October 1932, I was in the employ of Hugh L. Cooper & Company as a member of the engineering staff engaged in the design, construction and later the operation of the Dnieprostroy hydroelectric project on the Dnieper River, in Russia.

In June 1933, to September 1934, I was employed as consulting engineer for the City of Florence and as consulting engineer for some other municipalities in Alabama. This work had to do principally with electrical distribution system and with the water works plant in Florence, Alabama.

From September 1934 to July 1, 1936, I was employed in the Department of Justice as Special Assistant to the Attorney General. My work with the Department of Justice consisted of studies of the New, James, Greenbrier and Kanawha Rivers, with a view to their navigability, their navigable possibilities and the engineering aspects of the issues involved in two cases, namely: U. S. v. Electro-Metallurgical Corporation and U. S. v. Appalachian Electric Power Company.

I may add that my employment with the Department of Justice terminated June 30, 1936, and that since July 1, 1936, I have been in the employ of the City of Florence, Alabama, as engineer and general manager of the electrical distribution system of that city.

By Mr. THOMPSON:

Q. How much time have you spent on the study of the New, Kanawha and the other rivers you named?

A. Altogether about a year and nine months.

Q. Have you ever been on the New and Kanawha Rivers?

A. Yes, sir; many times.

Q. How far up New River have you been?

A. I have been up as far as in the general vicinity of the two main forks—the head waters of the river.

Q. What is that called up there, where they come together?

A. It is in northwestern North Carolina, the North Fork and South Fork of New River.

1748 Q. State what research you have made of the records that have to do with the New and Kanawha Rivers?

A. I have read the annual reports of the Chief of Engineers on those rivers. I have made two trips of inspection of those rivers from the mouth of Wilson Creek to Charleston, West Virginia. I have also been down to the mouth of the Kanawha River, at the Ohio River. I have read the report of Chief Justice Marshall, made in 1812 to the General Assembly of the State of Virginia,

referring to a proposed water highway for connecting the Ohio and James Rivers through the Kanawha and New and Greenbrier Rivers.

Mr. JACKSON. I move to strike out the reference to the Marshall Report. He states it provides for a highway, and he should not interpret it.

The COURT. What is the statement?

Mr. JACKSON. That the report was for a proposed water highway from the Kanawha through the New to the James River. I do not understand it that way.

Mr. THOMPSON. That is what the Legislature authorized—to make that study, and I think that they are almost the literal words.

The COURT. Let it stay in.

Mr. JACKSON. Note our exception.

I have examined the report of Moore and Briggs, made in 1819 on behalf of the Board of Public Works of the State of Virginia, covering an investigation with respect to a proposed water highway for connecting the Ohio, Kanawha, and New Rivers with the James River by way of Sinking Creek, and also a waterway for connecting the Ohio by way of the Kanawha, New, and Greenbrier Rivers with the James River.

I have made a study of the report of Major Graighill of January 27, 1871, covering an investigation and report of the methods and cost of improving New and Kanawha Rivers for navigation. I have also studied the report of Major F. W. Alstaetter, which was made in 1912.

By Mr. THOMPSON:

Q. Mr. Johnson, from your personal observation and studies of New River and the reports of the Geological Surveys, what would you say was the average number of days of the year in which water was above average in the Kanawha and New Rivers?

A. At the Radford dam site I should say that water above the mean annual flow prevails for about 126 days a year.

At the Hawk's Nest dam site I should say that water above the average annual stage prevails for about 110 days a year, and at the Kanawha Falls, on the Kanawha River, I should say that water above the average stage would prevail for about 114 days a year.

By Mr. JACKSON:

Q. That last statement is not clear to me. You use the flows a part of the time and average a part of the time.

1749 A. It means stages at mean flow. I can go back and make it clear. I believe the question was mean stage, wasn't it?

By Mr. THOMPSON:

Q. Yes.

A. Mean stage.

Q. And by "stage" you mean "flow," do you?

A. Yes, that is what I mean, and I wish to have that understood. The stages above mean flow, I will put it, prevail about 114 days per year.

Q. From the sources which you have indicated in your previous testimony, what would you say was the average flow in the New and Kanawha Rivers?

A. At the Radford dam site, the average annual flow is 3,211 cubic feet per second. At the Hawk's Nest dam site it is 9,600 cubic feet per second. At Kanawha Falls it is 13,000 cubic feet per second. At the mouth of New River it is 9,645 cubic feet per second.

By The COURT:

Q. Those figures represent what?

A. Those figures are average annual flows.

Q. The larger percentage of the water flowing into Kanawha River comes from the New River watershed above Radford. The flow at Hawk's Nest is 9,600 feet and the flow at Radford is thirty some hundred feet.

A. 3,211.

Mr. THOMPSON. We do not say that is on the average, but there are certain stretches on which the opposite is true.

WITNESS. It is during low water periods.

Mr. JACKSON. May I make one inquiry; I understood you to ask the witness to give these figures from records which he referred to, and that was the annual engineering reports. I wonder whether or not there are additional reports?

WITNESS. The U. S. Geological Survey is the basis of these figures.

1750 Mr. THOMPSON. And he has also testified that he has made personal observation.

Mr. JACKSON. I did not suppose that he based these on personal observation.

By Mr. THOMPSON:

What would you say, from the sources you have already testified, as to the basis of your information as to the average when the low flows usually occur?

A. The low flows usually occur between July and November, but there are some exceptions to that rule.

Q. What are the exceptions, if you know?

A. Well, the exceptions I do not exactly recall very definitely. There is one striking exception that comes to my mind, and that

is that in the year 1930, the low flow period began very much earlier than July; in fact, it began back in April, and I might refresh my memory from the water supply papers as to other years. There are, of course, other years when the periods vary from that I have given.

1751 Q. State to the Court some of the dry years that are shown from the records.

A. The years 1921, 1925, 1926, 1930, 1932, and 1933. Those were years of low flows.

Q. Now, have you made any study, or did you hear Mr. McWhorter testify?

A. The greater part of it.

Q. Did you see the chart which he introduced here of the channel of New River and the Kanawha?

A. I did.

Q. Have you made any study of that chart and channel?

A. I have examined that chart and the channel very closely.

Q. Have you made any study of it in the light of the reports of '72, '74, and '78 of Major Craighill?

A. I have gone over in considerable detail comparing the profile as presented with the documents presented with the reports made by Major Craighill and the surveys.

Q. You say you did that?

A. Yes, sir.

Q. I understand you say now you prepared that chart?

A. I say I made a close study and examination of the chart and of the reports, much of which information was used in the preparation and construction of the profile.

Q. From your study of the channel of this river, as you have outlined, and from your reading and study of the Geological Survey reports, what would you say as to whether or not there is sufficient water for navigation on New River, during the periods you have described, as above average flow?

By. Mr. JACKSON. I object to the question as irrelevant and immaterial. I object to it further as to the competency of this witness to answer any question with reference to navigation. His qualifications do show he has familiarity with the electrical development, but do not show any qualification whatever with reference to navigation.

By the COURT. I didn't quite get the question. I thought you left something out.

By Mr. THOMPSON. I asked from his judgment or from the study he had made of the channel of this river, the depths, etc., his study of the place, as indicated by the Water Supply Papers of the Geological Survey, whether there was sufficient water

at times above average flow for navigation on that river, and your Honor, that question was put in the Utah case.

By Mr. JACKSON. Not to this witness.

By the COURT. It seems to me it has been gone into in this case already, hasn't it?

By Mr. THOMPSON. Your Honor, this witness will take a different phase of the case. Here is a witness who testified for years he was reading the gages and watching the flows of the Tennessee River at its most important part.

By Mr. JACKSON. I would not consider that made a man a navigator. I might read gages. There is not the slightest competency of this witness to testify on this subject, and it is irrelevant and immaterial. The volume of water is not material, almost any stream has enough water if one removed obstructions and dammed it up it would supply some sort of navigation.

By Mr. THOMPSON. The volume of water is one of the most essential factors in navigation. We are asking him as an expert on channel depths and water flows as to whether there would be enough water for navigation.

By the COURT. He may answer.

By Mr. JACKSON. May I make my point a little clearer? The quantity of water appears very clearly from many witnesses, as well as this witness, the flow of this stream. Now the question here is, is that quantity of water sufficient for navigation? Now if that isn't a conclusion to be made by the Court, this much seems to be perfectly clear, this witness hasn't the qualification to express any opinion on that subject. All that appears in the record as to his qualification is that he has done considerable electrical work for manufacturing companies, and has read gages. That has nothing to do with the question of what would be a sufficient quantity of water, standing alone, for navigation.

By Mr. THOMPSON. If you have depths, heights and quantity, you can certainly draw a conclusion if you can put a boat through of a certain size.

By Mr. JACKSON. If that is all that is needed, then the Court can draw any sort of conclusion to be drawn from that sort of facts, and this witness under no hypothesis could bring any aid to the Court, because his qualifications do not touch that field.

By the COURT. I will let him answer, although I hold exactly the same view you do.

By Mr. JACKSON. May the record show our exception?

By the COURT. Yes.

NOTE.—Question read.

A. During such periods when the river is above average stages I should say there is sufficient water for navigation on New River.

Q. What do you mean by navigation, Mr. Johnson?

By Mr. JACKSON. I object to that question.

By the COURT. He may answer.

By Mr. JACKSON. Exception.

1752 A. I mean the floatability of logs, rafts, flat bottom boats, bateaux, keel bottom boats, steamboats and other small craft.

Q. From the source of information about which you have testified, from your personal observation, what would you say as to whether or not there was sufficient water in New River during the periods of average flow?

By Mr. JACKSON. I object to that question. The witness has no competency whatever to answer the question. Any conclusion to be drawn, could be drawn by the Court without any conclusion or opinion of this witness, and I think it is incompetent and irrelevant.

By the COURT. Let him answer.

By Mr. JACKSON. Exception.

A. During the periods of average flow I should say there is sufficient water for navigation in New River.

Q. You mean by that the type you have testified to?

A. Yes, sir.

Q. From the sources you testified to, and your personal observation, what would you say as to the sufficiency during extreme low flow period annually on New River for the types of boats and navigation you have testified to?

By Mr. JACKSON. I object to the question upon the ground it appears affirmatively from the record this witness is without competency to answer the question, and invades the province of the Court.

By the COURT. He may answer.

By Mr. JACKSON. Exception.

A. During periods of extreme low flow, which may occur, or such as do occur annually, I should say there is sufficient water in New River for navigation, so long as this flow is not interfered with by artificial obstructions, such as that occasioned by the Buck and Byllesby dams, assuming an improved river, when not frozen over.

By the COURT:

Q. You mean assuming an improved river?

A. Yes, sir.

Q. What do you mean by that?

A. A river that has the channels restored, or where over ledges and chutes channels have been cut through to provide the necessary depth.

By Mr. THOMPSON:

Q. You mean have already been cut through?

A. Where they have already been cut through. I should
sume that repairs would be needed, and where boulders are
the river, the boulders would have to be blasted out, and wh
minor obstructions to navigation occur, or where artifi
obstructions occur, those would all have to be removed.

Q. What do you mean by artificial obstructions?

1753 A. That would be stone, debris, boulders, at such pla
as the Buck and Byllesby, bridges, and material thro
into the river of considerable size, by the construction of railw
and highways. It would be obstructions placed there other th
by natural means.

Q. Might not boulders be stationed there by natural means?

A. Boulders in some instances are placed in the river, or
into the river, as a result of construction carried on by a railr
or by highway construction.

Q. You are not referring to boulders that are there by natu
means, but rather those by artificial means?

A. I am referring to both. To improve the channel, if th
were no artificial obstructions, would not be so difficult as it wo
otherwise be if it were necessary to remove the artificial obstr
tions, but a large number of artificial obstructions would have
be removed.

Q. I don't know I understand you. State whether or not th
are any artificial obstructions by way of boulders in that river

A. I will cite an instance. In the lower reach of the river,
C. & O. Railway, in grading their tracks closely beside the ri
have encroached upon the river width by filling out over what
formerly the bank and in doing so they have allowed large sto
to roll down, or they have rolled down, and it is evident from
inspection of the river, and I have seen it myself, that this
narrowed the width from its original width.

Q. Is that what you mean by the boulders you would have
remove?

A. You would remove those boulders as well as such ot
boulders as it may be necessary to remove that you may find w
already in the river, particularly in the lower fifty mile stre
of the river from below Hinton to below Hawk's Nest.

By Mr. JACKSON. I understand while I have not interrupt
as to each question, all of this testimony is subject to our objecti
and our exception is allowed?

By the COURT. Yes.

Q. How far can you float logs on New River during the ma
mum, mean and low flow?

By Mr. JACKSON. I object to that question, because it is a triple question, and because the witness on the face of the record is wholly incompetent to make any answer to the question, and further because it is irrelevant.

1754 By the COURT:

Did you ever float any logs down there and try it?

A. No, your Honor.

By the COURT. There is a great deal of evidence in here on the flows and where the channels are located. I will let you ask him about floating logs.

By Mr. JACKSON. Exception.

1755 A. I should say that for flood stages it would be possible to float logs from the mouth of Wilson Creek to below the mouth of the New River; and that during mean stages of the river it would be possible to float logs from Wilson Creek, the mouth of Wilson Creek, to below the mouth of New River; and during moderately low stages of the river I should say it would be possible to float logs from Foster Falls, Virginia, to Hinton, West Virginia.

Q. Have you observed the condition of the channels where the Government has made improvements in the past?

A. I have observed the channels in many places.

Q. Have you observed the channel from Radford upstream above where the project of the defendant is located, up to Allisonia?

A. In some places; yes.

Q. What is the condition of that channel?

By Mr. JACKSON. I object to the competency of the witness to describe the condition of the channel. It is shown he had no knowledge about channels.

By Mr. THOMPSON. He has seen the channel, looked at it, and waded into it.

By Mr. JACKSON. He has not stated that.

By Mr. THOMPSON. He has testified he has seen it.

By Mr. JACKSON. I didn't know where you got the wading.

A. I noticed it was used in a good many places for motor boating.

Q. What is the condition of it?

A. The condition, I forget just what the slope is.

Q. I am asking for that part the Government improved, according to the map?

A. The channel has had some improvements made in that section, some of which are in evidence.

Q. State whether or not any of that channel has any silt or debris in it, according to your investigation?

A. In the chutes, there are some stones. I have not noticed that there was silt in the chutes. Silt is to be found in most reservoir pools.

By the COURT:

Q. What do you mean by reservoir pools?

A. I mean any pools, any still basin will accumulate a certain amount of silt during certain times and may be flushed out during floods and large stones deposited during floods.

Q. Have you made any study of what is known as the 308 Report, Government Exhibit #145?

1756 A. Yes, I have.

Q. Can you give us the height of the pool, at its maximum, of the Bluestone reservoir?

A. The Bluestone reservoir pool at its maximum height would be 150 feet high or about that.

Q. Have you seen any of the plans for the construction of this reservoir?

A. Yes. I have examined some of the preliminary plans.

Q. What plans have you seen?

A. I have noted the general plans and elevations and some plans that showed the power house and some showing navigation structures and facilities.

By Mr. JACKSON. I move to strike out the statement of the witness that not merely had he examined plans, but he had examined plans showing navigation construction and facilities. I don't think there are any, but if there is, the proof will have to be made in a competent fashion, and not by this witness, as to something he has seen somewhere. The only thing about the Bluestone before this Court is what is in the 308 Report, to which your Honor referred a moment ago.

By Mr. THOMPSON:

Q. I hand you, marked for identification, Government Exhibit #200, 200-a, and 200-b, consisting of three pages, and with the words up in the left-hand corner: "War Department," and then down in the right hand corner: "Preliminary study of New River, Bluestone Reservoir project, dam navigation features, log chute flume type with adjustable sections," and dated January 1, 1936, U. S. Engineer's Office. Harry Pockras, Principal Engineer, and approved by John Conklin, Major, Corps of Engineers, and ask if you know what that is?

A. It is a print of the log chute of the Bluestone dam showing for facilities to pass logs.

By Mr. JACKSON. I object to the statement of what it shows, and move to strike it out.

By the COURT. Overruled.
By Mr. JACKSON. Exception.

By Mr. THOMPSON:

Q. Where did this come from?

A. This was prepared by the War Department Corps of Engineers.

By Mr. JACKSON:

Q. Are you reading from the lower right hand corner?

A. I am reading from the upper left hand corner. I didn't read it all as a matter of fact, I was supplying the rest, my eye merely fell on the "War Department." I have seen these exhibits before.

By Mr. JACKSON. Is it offered or not?

By Mr. THOMPSON. We offer this exhibit in evidence at this time.

NOTE.—Tracings marked "Government Exhibit Nos. 200, 200–a and 200–b" so marked and filed.

By Mr. JACKSON. I object to it, as not properly proved. This witness didn't make the exhibit, and doesn't know anything about whether it was ever authorized or what its status is, or anything else.

By Mr. THOMPSON. We are offering it exactly for what it is worth at this time. It has been shown in evidence the War Department is in a state of developing this whole plan and we simply offer this as of January, 1936, and that was the plan at that time.

By Mr. JACKSON. That last is purely a statement of counsel.

By the COURT. Objection overruled.

By Mr. JACKSON. Exception.

By Mr. THOMPSON:

Q. Will you please look at Government Exhibit 200 and I will ask you whether there is some provision on there for a log shoot?

1757 A. Yes, sir; there is.

By Mr. JACKSON. If Your Honor please, I assume, inasmuch as Your Honor has admitted these exhibits over our objection, you will let it be understood that our objection applies to what they show, and to avoid interrupting it will be understood that all of our exceptions having to do with exhibits 200A and 200B are insisted upon by the defendant, and that an exception is allowed to the ruling of the Court.

By Mr. THOMPSON:

Q. Now state whether or not any plan for a log crane is provided on page 2?

A. It shows the drawing providing a device for a log chute.

Q. Is there a log crane on that exhibit 200A or a plan for a log crane?

A. A log chute.

Q. What is the title here?

A. That is the crane shown on top.

Q. Now in reference to exhibit 200B.

A. Exhibit 200B is a drawing which shows a barge lift for construction at the Bluestone Dam, to permit the passage of barges from downstream to upstream, and from upstream to downstream over this dam.

Q. Mr. Johnson, assuming that the construction and operation of the Bluestone Dam at Hinton on the New River is as described in the 308 report, of the Secretary of War, House Document 191, Exhibit 145, how would the depth of the river upstream from the Bluestone dam site be affected, if at all?

A. It would create a slack water of pools at the maximum height, as provided by the plan, for a distance of about 36 miles upstream from this dam.

Q. To what point?

A. That would be approximately to Narrows, Virginia, I believe, and it would be about 13 miles across the State line.

By Mr. JACKSON. I move to strike out the statement of the witness that it would be 13 miles across the State line because there is no proof in this record that the witness knows where the State line is.

Motion overruled. Defendant excepts.

By Mr. THOMPSON:

Q. What would the conditions of navigation be in that pool when filled to useable storage?

By Mr. JACKSON. I object to the competency of the witness to testify as to navigation conditions in this pool.

By the COURT. You mean as to the depth of the pool?

By Mr. JACKSON. We object to the form of the question. He can state the depth of the pool, and how far up there would be certain depths.

By Mr. THOMPSON:

Q. How far up would there be a 9-foot depth for navigation?

Objection.

By Mr. JACKSON. Did I understand that Your Honor overruled my objection?

By the COURT. Yes.

Defendant excepts.

A. For a distance of about 27 miles for 9 foot navigation.

1758 Is that for the upper pool navigation or normal pool navigation?

Q. Normal pool navigation.
A. Normal pool at 1485. I would consider that normal, and is sought to maintain the pool at that elevation for the greater rt of the time. That would provide 9 foot navigation for a stance of more than 4 miles across the State Boundary or to thin less than 3 miles of the Town of Glen Lyn, Virginia.
By Mr. JACKSON. I again move to strike out the statement of e witness as to the State boundary, as incompetent.
Motion denied. Defendant excepts.
A. That would be for drafts up to 9 feet.

By Mr. THOMPSON:

Q. Could there be any navigation beyond there for a draft less than 9 feet?
A. Yes, there would be a pool for small flows in the river, thout any appreciable amount of back water effect and would eate slack water for a distance over the State line of about five iles, and would give almost an additional mile of navigation r light draft vessels and crafts.

By Mr. JACKSON:

If Your Honor please, may it be understood that all the testi- ony of this witness with reference to the State line is subject the objections we have heretofore made, and on the further ound that there is no showing here that he has any knowledge the State Line.
A. I will say then to within two miles of the town of Glen yn.

By Mr. THOMPSON:

Q. Do pools of this kind create back water?
A. Back water is created by flows into pools of this kind.
Q. That is what I meant.
A. Yes, sir.
Q. If the Radford project were constructed to provide as one its purposes a navigation project, extending from its dam e to Allisonia, to what extent would the project, as so con- ucted, differ, if any, from the proposed Radford project?
By Mr. JACKSON. It seems to me that he is comparing the dford project with the Radford project.
A. If one of its purposes——
By Mr. JACKSON. One minute, please.
By the COURT. I do not understand your statement there, Mr. ompson. Are you basing that question on navigation projects ending from Bluestone to Allisonia?
By Mr. THOMPSON. I am not speaking about Bluestone, I am aking about the Radford project.

By the COURT. I am asking the question if constructed to operate as what, or if what is constructed?

By Mr. THOMPSON. If the Radford project was constructed to operate as a navigation project as well as a power project, would there be any difference in the construction and operation?

By Mr. JACKSON. I object to the question because it is certainly obvious that this witness is not at all competent to answer the question. I object further on the ground that it is irrelevant and immaterial. The most this witness could possibly do would be to state what length of pool there is, what depth there is, for a certain type dam, and that is as far as he can go.

By Mr. THOMPSON. He first states that this witness is not competent to testify here on that subject. Here is a man that was an engineer on the Muscle Shoals project which was constructed, and which is both a navigation project and a power project, he not only was instrumental in constructing it but he ran it for a long time, so that I say, first of all he has shown his competency and is competent to testify on this matter.

The question arises, can he run a power project or construct it in the same way as you would if it were both a power and navigation project. That is the question I am asking him.

By Mr. JACKSON. He is not a navigation expert simply by testifying that he assisted in the design of the power project, the Wilson Power Plant, and what he said in his qualification shows that he had no qualification as a person who is competent to answer this question.

By the COURT. I am not sure that I caught the nature of the question.

Do you mean how should the Radford dam be constructed other than it is now planned?

By Mr. THOMPSON. Yes, if it were to be constructed so that there could be navigation up there.

By Mr. JACKSON. On the pool?

By Mr. THOMPSON. Yes, as an aid to navigation.

By the COURT. Aid to navigation above the dam?

By Mr. THOMPSON. Yes.

By Mr. JACKSON. I object to the competency of the witness and the relevancy of the question.

Objection overruled. Defendant excepts.

A. There would be no difference in the manner in which the dam would be constructed if one of the major purpose of
1759 the Radford project in its function and operation was to provide navigation on the pool from the dam site to Allisonia, but there would be a difference in the method of operation. If navigation were to be maintained from the dam site to Allisonia, then the pool, under the circumstances, would

have to be kept at or near the upper limit of its level, its maximum level.

By the COURT:

Q. That simply means that if the pool were not kept at or near its upper limit, then nagivation would not be extended as far as Allisonia?

A. Exactly.

1760 Q. But take some point on the river nearer down, you would have a navigable pool to that point?

A. Yes, sir; you would have a project somewhat similar to the Tennessee River projects. And such projects as are employed on navigable rivers.

By Mr. JACKSON. I move to strike out the last statement of the witness.

By Mr. THOMPSON:

Q. Have you ever been to the Buck dam?

A. Yes, I have.

Q. What would you say as to the length of the pool behind the dam?

A. It is about a mile and a half, possibly slightly over a mile and a half.

Q. Have you been to the Byllesby dam?

A. Yes, sir.

Q. What would you say as to the length of the pool behind the Byllesby dam?

A. It is something over 3¼ miles.

Q. Have you been to the Washington Mills dam?

A. Yes, sir.

Q. What is the length of the pool behind it?

A. About four miles, perhaps slightly more.

Q. State whether or not you have made any studies of the ferries that cross New River?

A. Yes, sir; I have. I have investigated the ferries on New River.

Q. How many ferries are there now operating on New River from Wilson Creek to its mouth?

By Mr. JACKSON. I object to the question as irrelevant and immaterial.

Objection overruled. Defendant excepts.

By Mr. THOMPSON:

Q. Answer the question.

A. There are approximately 44 ferries, 33 of which were in operation in July, 1936, and eleven of which have operated as recently as 1935, but which had either ceased or suspended operation prior to July, 1936.

Q. What are the types of the boats that are used at these ferries?

1761 A. They are the customary river ferry boat, sizes about from 9 to 12 feet in width and about 28 to 62 feet in length.

Q. Have you got any idea of their draft when loaded?

A. That will depend on the amount of free board, the manner in which they are constructed, and as to their size. I should judge a fair average loading would be to a draft of about 12 to 14 inches.

Q. I hand you marked for identification Government Exhibit 201, and will ask you what that is?

A. It is a map showing existing ferries below the mouth of Wilson Creek on the New and Kanawha Rivers.

Q. State whether or not that map was prepared under your supervision?

A. It was.

Q. What indicates the ferries on the map?

A. The red rectangle.

By Mr. THOMPSON. We offer this Government Exhibit 201 in evidence.

By Mr. JACKSON. Is it offered as any evidence of the location of the State line?

By Mr. THOMPSON. No, sir.

By Mr. JACKSON. If not, we have no objection to it.

By Mr. THOMPSON. We are simply offering it to show where the ferries are on the river.

By Mr. JACKSON. We object to the relevancy.

(Objection overruled. Defendant excepts.)

(Said map is here filed in evidence, and marked Government Exhibit 201.)

By Mr. THOMPSON:

Q. I hand you, marked for identification, Government Exhibit 202 and will ask you what that is?

A. It is a map showing the ferries in operation prior to 1935, as shown by records of the United States Geological Survey, below the mouth of Wilson Creek on New and Kanawha Rivers.

By Mr. THOMPSON. I now offer this Government Exhibit 202 in evidence.

By Mr. JACKSON. I suppose it is not offered as any evidence of the location of the State line.

By Mr. THOMPSON. No, sir; it is just offered to show where the ferries are.

By Mr. JACKSON. Then we simply object to its relevancy.

By Mr. THOMPSON:

Q. State whether or not the ferries which are indicated on these maps are all the ferries which have been used on this river?

By Mr. JACKSON. Since when?

By Mr. THOMPSON. At any time.

By Mr. JACKSON. I object to the competency of the witness to answer such a question.

(Objection overruled. Defendant excepts.)

A. No, sir, it is not all. The records I have examined, show all told, 57 ferries, including present and past ferries, have operated on the New River.

Q. And what records have you examined?

A. Records of the surveys made by the U. S. Geological Survey.

Q. Have there been any ferries in operation in what is known as the 50-mile stretch between Hinton, W. Va., and the mouth of New River?

A. Yes, sir.

Q. How many?

A. There were five ferries in this 50-mile stretch, in operation in 1911.

1762 Q. Where were they located?

A. There was the Bowyer's Ferry near Sewell, at Mile 18½, which is from the mouth of New River. There was a ferry at Beury at about mile 21½.

Q. Above the mouth of the river?

A. Yes. All mileages refer to the mouth of the river.

Q. Where was the next one?

A. I don't believe I mentioned the one at Sewell.

Q. Yes, you did.

A. The next one is Terry June, at approximately Mile 38. There is another one at Mill Creek at approximately Mile 42.

Q. What is the next one?

A. The next one is at Glade, at approximately Mile 44.

Q. Including those which you have just named and those which have been in operation, how many ferries have there been in operation on New River, all told?

A. All told, 57 ferries have operated according to the records of the U. S. Geological Survey, as I was able to note them or able to determine.

Q. Have you noted on the exhibit the times when these ferries have operated, I mean on Exhibit 202?

A. You mean the period?

Q. Yes, sir, the dates.

A. The ferries shown on Exhibit 202 on New River are those which have operated prior to 1935, including the ferries now in operation, the present ferries.

Q. And they show the dates, do they not, opposite the name of the ferry?

A. In several instances, or in a great many instances they do. Those are the dates when surveys were made, and the ferries were then in operation as of those dates.

Q. You mean by surveys, the U. S. Geological Survey?

1763 A. Yes, sir.

By Mr. JACKSON:

Q. You mean the topographic map, Mr. Johnson?

A. Yes, that is right.

By Mr. THOMPSON:

Q. State how many ferries on New River you have inspected, if any?

A. I visited the sites of 33 ferries, which are now operating, or most of the present existing ferries.

By Mr. JACKSON. If Your Honor please, I was not looking for any statement on these exhibits, but I notice on Exhibit 201, the Government has again followed the policy of stating conclusions, and I find this on the exhibit: To wit: "Many such ferries not operating were forced to suspend service because of damage to the boats caused by the floods and ice that occurred during the winter of 1935–36."

I move to strike that statement from the exhibit, as not being an appropriate legend to place upon the exhibit.

By the COURT. All right.

By Mr. THOMPSON:

Q. Where did you get that information from as to this statement on Exhibit 201, and which statement has just been read by Mr. Jackson?

A. I got that from the ferry owners and operators in most instances, and from inquiries at or near the sites of those ferries when I visited them.

Q. That is the result of your personal investigation?

A. Yes.

Q. What is the nature of the commerce that these ferries carry, if you know?

A. They transport passengers, vehicles, livestock, commerce, general merchandise, and other commerce.

By Mr. JACKSON. I move to strike out the statement of the witness that they transport commerce.

Objection overruled. Defendant excepts.

By Mr. THOMPSON:

Q. Now will you please look at Exhibit 201 and state to the Court what ferries there are located between Radford dam site and Allisonia?

A. There are five ferries now in operation between Allisonia and the Radford dam site.

Q. Just name them.

A. Just below Allisonia there is a ferry which is called the Allisonia Ferry. Then there is the Clark Ferry. Next is the Whitt ferry, then the Towes Ferry and then to Cecils ferry.

Q. Now what ferries have been in operation between the Radford project, that is, the dam site and Allisonia, that are not running now?

A. There was Eanes Ferry, Macks Ferry, Lowman and Linkous, which were recently discontinued, or as recently as 1935.

Q. What was the time of your inspection of these ferries?

1764 A. It was in July, July 3rd to 5th, inclusive.

Q. Of this year?

A. Yes, sir.

Q. What was the condition of the stream on New River as to flow?

A. It was at the customary summer low flow.

Q. Did you take any pictures or photographs of the river and the place where the ferries crossed?

A. During this trip of Ferry inspection, I had along with me a camera and one of the men in the party with me took photographs.

Q. I hand you an album of photographs marked for identification Government Exhibit 203 and will ask you to look at it and state whether you know what it is?

A. Yes, sir; it is an album showing photographs of ferries that were made at my direction, while I personally looked on, and I was in most of the photographs myself.

Q. Were all of these photographs taken in your presence?

A. Yes, sir; they were.

Q. And when were they taken?

A. They were taken during the period from July 3, to July 5th, inclusive, 1936.

By Mr. THOMPSON. I now desire to offer this Government Exhibit, marked for identification, 203, in evidence.

By Mr. JACKSON. We desire to object unless the government will strike out the statement that appears in photograph No. 9.

By Mr. THOMPSON. If counsel will look at each one of the photographs and if there is any matters that they object to——

By Mr. JACKSON. I just made a statement in regard to Photograph No. 9, and have objected to what appears on Photograph No. 9, as to when service was suspended and that they expect to resume the service soon. I did not state that at first, but I did object to what was on Photograph No. 9. You will see there that it states that service will be resumed as soon as a new ferry can

be built. If such statements are stricken from the identification strip we will not object except as to its relevancy.

By Mr. THOMPSON. Is there any other statement on the pictures that you would like stricken out? That is the only one I see.

By Mr. JACKSON, Just look at 29, 26, 14 and 12.

By Mr. THOMPSON. Any of that language in there where it explains the reason for suspending, I am perfectly willing that it be stricken out.

By Mr. JACKSON. That is all right, then.

By Mr. THOMPSON:

Q. Now, Mr. Johnson, look at these photographs in this album, Government Exhibit 203, which we now file as Government Exhibit 203, and please state what the first one is on the first page?

A. The first one is the Meadow Creek Ferry, at about Mile 49.2 on New River.

Q. I will ask you, Mr. Johnson, whether all of these photographs were taken on this trip?

A. Yes, sir.

Q. So that goes to all of them?

A. Yes, sir.

Q. All right, what is the second one?

A. The second ferry is Sandstone Ferry, at about Mile 52.5 on New River.

1765 Q. Where is Sandstone Ferry located?

A. It is about 10 miles below Hinton.

Q. Is that in what is called the gorge?

A. It is just above the approach to the gorge. The ferry is shown on the opposite bank of the river in this picture. It is in the far background and may be seen.

Q. Now take the next page, No. 3A, what is that?

A. No. 3A is U. S. Engineers Ferry at about Mile 66, on the New River. The ferry is on the opposite side of the river and it is used for Government employees only. It is on the other side of the river near the site of the old Packs Ferry.

Q. Is that in the gorge?

A. It is not in the gorge. It is near the Bluestone Dam site.

Q. Now what is the next one?

A. Ferry #3, Haynes Ferry, at Mile 67.5 on the New River. The ferry in this instance is also tied up at the opposite bank of the river, in the background.

Q. Now take the next page?

A. No. 4, is Bull Falls Ferry at approximately Mile 74.1, on the Kanawha River.

Q. Is that above or below the falls?

A. It is just above the falls, but the falls may be seen from the ferry site.

Q. Now take the next one?

A. No. 5, is Shanklin Ferry, at Mile 82.9 on the New River.

Q. All right, take the next one?

A. McCoy Ferry, 126.2 on the New River—a motor propelled ferry.

Q. Did you see that ferry operated?

A. No, sir; I did not.

Q. What is the next one?

A. No. 8, is Whitethorne Ferry at about Mile 132.8, on New River.

Q. That is just a few miles below Radford, is it?

1766 A. Just a short distance, not a great distance below Radford.

Q. Now turn to the next page?

A. #9, Peppers Ferry at Mile 139.5 on New River.

Q. That is Ferry #9?

Q. Now, what is No. 10?

A. No. 10 is Dudley Ferry, Mile 144.5, just below Radford, or you might say at Radford. This was a passenger ferry only.

Q. Now take the next one, or No. 11?

A. Ingles Ferry, approximately at Mile 148.7, on the New River.

Q. Now take No. 12?

A. That is Cecils Ferry at approximately Mile 154.2, on the New River. The photograph shows an old boat now out of service which has been replaced by a new boat which was brought down from Lowman's Ferry.

Q. Now turn to the next page, or No. 12?

A. That again is Cecils Ferry at Mile 154.3, and this shows the boat now in operation.

No. 13, is Towe's Ferry, at mile 157.3.

No. 14, is Linkous Ferry, mile 158.6. The Ferry is shown on the opposite side of the river.

The next is No. 15, Whitt's Ferry, mile 159.9, New River.

Eanes Ferry, No. 17, mile 164.4; service suspended and cable removed.

No. 18, is Clark's Ferry, mile 170.7.

No. 19, is Allisonia Ferry, mile 173.6.

1767 No. 20 is Barren Springs Ferry, mile 177.7.

No. 22—Austinville Ferry, mile 189.2.

No. 23, Ivanhoe Ferry, mile 192.9.

No. 24, Fowler Ferry, mile 196.5; shoals below 400 feet down stream from ferry site.

No. 25 is Bower's Ferry, 199.2—a motor propelled ferry. I sat it in operation.

No. 25 again is Bower's Ferry, mile 199.2. The picture shows it in operation near midstream.

No. 26 is Dixon's Ferry site, mile 204.2. Service discontinued and has been since 1922; the head of Dickinson's shoals are shown in the background of the picture.

No. 27—Blair's Ferry, mile 205.4.

No. 30 is John Bowyer's Ferry, mile 221.2.

No. 31 is known as Henry Bowyer's or Mary Bowyer's Ferry, mile 224.6; the Appalachian Electric Company's gaging station is shown on the opposite bank.

No. 32 is A. R. Shaw's Ferry, mile 227.2.

No. 33 is Troy Cox's Ferry, mile 241.5.

No. 34 is S. E. Rose's Ferry, mile 244.

No. 35 is Preston Osborne's Ferry, mile 244.5.

No. 37 is Potato Creek's Ferry, mile 246.3.

No. 38 is Wheatley's Ferry, mile 250.

No. 39 is Opal Halsey's Ferry, mile 251.6. It is shown about to leave the bank to proceed across the river.

No. 40 is N. C. Halsey's Ferry, at approximately mile 252.

Q. In your trips up and down the river, have you seen boats in the river?

A. Yes, sir; a good many.

Q. What type of boats have you seen?

A. Mostly row boats; a few motor boats.

1768 Q. You say you saw them up and down the river. What stretches of the river would you indicate?

A. I saw numerous boats on all stretches above the gorge of New River, as far as I went—near the head waters.

Q. What type of people used these boats?

A. They were generally farmers, people who lived in the vicinity near the river.

Q. Where were the boats going so far as you could observe?

A. They were used for passage across the river and some were moving up and down on the river. It was my information—that the ferries were used to transport farm produce to a considerable extent and that they were used very frequently—the boats were, I will say——

Q. The boats were used for what?

A. To carry school children back and forth to school where the school happened to be was on the opposite side of the river.

By Mr. JACKSON. We move to strike out as hearsay evidence his testimony with reference to the use of the boats.

The evidence not being struck, the Defendant excepted, to the ruling of the Court, for reasons stated.

By Mr. THOMPSON:

Q. Did you see school children in the boats?

A. No, sir; there were no schools in session at the time I was on the river.

The Defendant again renewed its motion to strike the evidence as being hearsay, which objection was overruled and the Defendant excepted, for reasons stated.

1769 Direct examination by Mr. THOMPSON:

Q. Have you ever been at the London pool?

A. Yes, sir.

Q. Do you know how far upstream that London pool produces a pool with a three-foot draw down?

A. For approximately to mile 92.

Q. Without it?

A. Shall I state my understanding of the question. The length of the London pool above this dam, when the pool has been drawn down three feet, will be approximately 9.2 miles, slack water will extend to about mile 92.

By Mr. JACKSON:

Q. The back water will extend that far?

A. Yes, sir, slack water.

By Mr. THOMPSON:

Q. If the three foot draw down is not used, how far upstream will there be a pool?

A. For eleven miles approximately upstream from the dam or to about mile 94 above the mouth of Kanawha River—in both cases I referred to the mouth of Kanawha River.

Q. You heard, you said, the testimony of Mr. Pierce here?

A. I did not.

Q. Did you read his testimony?

A. No, sir.

Q. Have you made a study of the United States Geological Survey records with respect to the flow of Kanawha River at Kanawha Falls in October 1930?

A. Yes, sir.

Q. State what the average flow at Lock No. 2 for the month of October was, in second-feet?

A. It was—the records of the United States Geological Survey show for the month of October 1930, the flow at that lock would average 1,143 cubic feet per second.

1770 Q. What was the corresponding flow at Radford Dam site from September 28th to October 28th, 1930?

A. It was 763 cubic feet per second—an average of 763 per second.

Q. How long do you estimate it takes water to travel from the site of the Radford Dam to Lock No. 2?

A. During periods of extremely low flow, such as has been indicated, I estimate about three days would be required for water to travel from the Radford Dam site to Lock No. 2.

Q. Assume that the Radford Dam site—assume it as being so constructed and in operation in 1930, and the stream flow at that point cut off from September 28th to October 28th, inclusive, what would be the flow in cubic feet per second entering Lock No. 2, for the corresponding period beginning and ending three days later?

A. Assuming the Radford project to have been in operation in 1930 and the stream flow cut off from September 28th to October 28th, inclusive, the flow at Lock No. 2 would have been about 465 C. F. S. per second.

Q. 465 cubic feet a second?

A. About 465 cubic feet a second would be the average.

Q. Did you figure any other item in there in making your subtraction from 1,143?

A. I did.

Q. What was that?

A. The flow from Little River was not the full amount to suffice to meet the requirements of the State of Virginia as to the flow passing down the river from that point.

Q. How far short did it fall?

A. About 85 C. F. S. short.

1771 Q. When you made this deduction, you also subtracted 85 C. F. S., did you?

A. From the flow at Radford, I believe 678 is the average flow which would have been impounded during that period behind the Radford dam, if Radford were required to release 85 C. F. S., to comply with the conditions of the Virginia State license.

By Mr. JACKSON. We move to strike that answer from the evidence. It is not responsive to the question, and instead of going into the flow at Radford, the witness undertakes to give some other answer based on the hypothesis of a construction at Radford of the Radford plant and it is erroneous for him to attempt to construe the license of the State of Virginia; he is not competent to construe it and he cannot construe it.

The foregoing evidence was not struck from the record and the Defendant excepted for reasons stated.

By the COURT:

Q. Where was 763 checked from—what gage station?

A. 763 was determined by proportionate drainage area based upon flows at the two gaging stations nearest to the dam site, one above at Allisonia and one below at Eggleston, and eliminating

from the computation the drainage area of Little River, which is in the intervening drainage area beween the two gaging stations, and determining the flow at the Radford Dam site then upon the basis of the proportionate drainage areas and flows at these two gaging stations after having deducted from the Eggleston gaging station the flow and drainage area of Little River.

Q. The flow at Little River was eliminated in order to arrive at the figures 763 for the Radford Dam site?

A. Based on that, yes, sir.

Q. Well, now, the question is simply this: If you cut off 763 feet of water from New River, to see how much the flow is in Lock 2, if I am not mistaken, it is a matter of subtracting the amount to 380.

A. May I explain that, under the conditions of the Virginia State license, they may not cut off the full amount of 763?

Q. The question was, if they cut off the flow at Radford—I don't remember anything about the Virginia license, and I don't care about that.

1772 By Mr. THOMPSON:

Q. Without considering the Virginia license. He simply took—I asked him if the flow was cut off at Radford, what would be the result.

A. There would have resulted under the circumstances a flow of 550 cubic feet per second at Lock No. 2.

By the COURT:

Q. How do you reach that figure?

A. By subtraction.

Q. Subtracting what?

A. Subtracting 763 from 1143.

By the COURT:

Q. I get that to be 380.

A. Oh, yes; it was my mistake.

By Mr. THOMPSON:

Q. Do you know what the leakage measured by the Geological Survey at Lock No. 2 on the Kanawha River was, before the construction of the present London and Marmet Dams?

A. The leakage as measured in September 1917 at Dam Lock No. 2——

By Mr. JACKSON. Are you reading from a book?

A. (Witness closes book in his hand.) I can give it to you without that.

By Mr. JACKSON:

Q. Are you giving the statements from some books?

A. No, sir; it is simply from notes I have.

It was 500 cubic feet per second through the dam. That was the leakage determined by the United States Geological Survey. It is found on page 119 of the United States Geological Survey Water Supply Paper No. 503. And further answering the question—depending on which of the two gates were closed—the leakage through the lock varied from 110 to 260 cubic feet per second.

By Mr. JACKSON:

Q. That is for 1917?

A. For September 1917, and from these measurements allowing for lockage water or water required to maintain the pool at its highest level—Lock 2 is estimated 750 C. F. S.

Q. In 1917?

A. Yes, sir; in 1917 it would have been that.

By Mr. THOMPSON:

Q. Assuming the Radford project to have been constructed and in operation in 1930, during the 31 day period, from September 28th to October 28th, inclusive, of that year, and
1773 that they shut off all the flow at the dam site, state whether or not the average flow of 465 second feet, which has been determined, what, under the circumstances would have been the flow entering—I mean, correct that 465 to 380, which had been determined—would be determined under the circum-
1774 stances, to be the flow entering pool—entering the pool above Lock 2 for the month of October, corresponding to the shut off period at the Radford Dam site, would this have been sufficient to furnish capacity navigation operations at Lock 2.

By Mr. JACKSON. We object to that. We object to any testimony that he may give about lockage or leakage in 1917, which he read from Water Supply Paper, as to what the effect would be in 1930, and secondly, the question relates to the effect upon the pool above Lock No. 2, which in this case has been shown has been long since removed and has no bearing on any action to be taken by the Court in this case, and third, it deals with the question of maintaining the pools for navigable depths, because this witness is not competent to express an expert opinion on that matter.

By Mr. THOMPSON. We are going to talk about 1925 to 1927.

By Mr. JACKSON. You said 1930.

By Mr. THOMPSON. Assuming conditions June 1st, 1927, when the Commission made a ruling—the Federal Power Commission made this finding; supposing conditions exist where you had this runoff, what would be the result in the pools below? It is true the dam has gone out, but had not gone out in 1927.

By Mr. JACKSON. The question related to 1930.

By Mr. THOMPSON. The assumption was the condition of the river in 1930, so far as the dry season was concerned and we took figures already testified to.

By the COURT. Your question was to this effect—supposing in 1930, the month you described, the month of October 1930, the flow of the stream at Radford Dam site was shut off.

By Mr. THOMPSON:

Yes, sir.

Q. What would be the effect on the pool then existing at No. 2 dam?

A. Yes, sir.

By the COURT. He may answer the question.

The Defendant excepts to the ruling of the Court, for reasons heretofore stated.

By the WITNESS. Assuming that the Radford project had been constructed and in operation in 1930——

By Mr. JACKSON (Interrupting.) I move to strike the answer so far as the witness has gone and that assumption that the Radford dam is in operation. The question is: Assuming the flow was cut off at the Radford Dam site.

By the COURT. All right. Assume that the flow is cut off.

By Mr. THOMPSON. Read the question. (The question is read.)

A. It would have been short of the requirements necessary for navigation by the difference between 750 and 380, or approximately 370 cubic feet per second under the circumstances; and this: that is of the amount needed for leakage and lockage at Lock No. 2 and navigation would have had to be suspended until some means could have been found and applied for stopping or reducing the leakage.

Q. What was the flow at the Radford Dam site from October 3rd to 8th, inclusive, 1930?

A. The flow at the Radford Dam, from October 3rd to 8th, inclusive, was 1930, was 696 cubic feet per second.

Q. What was the flow three days later at Lock No. 2?

A. It was 979 C. F. S., that is, October 6th to 11th, inclusive.

Q. What would have been the flow at Lock 2, if the Radford project had been cut off at that time?

A. That would have been the difference between 696 C. F. S. and 979 C. F. S., or 283 C. F. S.

Q. State whether or not the flow of 283 C. F. S., would have been sufficient water for six-foot navigation at Lock No. 2?. Or in the pool upstream?

By Mr. JACKSON. We object to the competency of the witness to answer that question.

The objection was overruled and the Defendant excepts to the ruling of the Court for reasons stated.

A. No, sir.

1775 By the COURT:

Q. Hasn't it been testified to in this case that, taking account of the leakage and the amount of losses putting vessels through the locks, that it took somewhere around 700 cubic feet a second to maintain the level of pool No. 2?

A. It was determined by the United States Geological Survey in 1917 that the leakage through Dam No. 2 was 500 cubic feet per second and through the lock itself was from 110 to 260 cubic feet per second, depending upon which lock gate was closed and after adding the water required for lockage, it is estimated that it would require about 750 cubic feet per second to meet all demands of navigation.

By the COURT:

Q. What he asked was if it could be maintained on 280?

A. Yes, sir.

By Mr. THOMPSON:

That is the idea.

A. My answer was that it could not have been.

Counsel for the Defendant excepts to the ruling of the Court for reasons stated.

By the COURT:

Q. Do you know the leakage of London Dam?

A. Your Honor, I have the War Department estimate of some leakage through there, although it is admitted that all leakage has not been determined; therefore; the estimates given and used represent in all probability something lower than the actual leakage.

Q. Have you certain figures as to what the leakage is?

A. Yes, sir.

Q. Do you have them in mind without looking for it?

A. Yes, sir.

Q. Do you know the amount of loss in ordinary amount of navigation through the London Dam by the discharge in the lock?

A. I didn't understand your question.

Q. Do you know the amount of loss of lockage through the London Dam?

A. Yes, sir.

1776 Q. Mr. Johnson, have you made any study of what is known as the 308 Report, Exhibit 145?

A. Yes; I have.

Q. What is the maximum height, from that record, of the Bluestone pool?

A. The maximum height is 150 feet above the tail water elevation.

Q. What does the report state as to the uses for which this dam is to be used?

A. The report states that this was a report recommending the construction of the Bluestone Project before construction had been authorized and ordered, and it states on page 4, near the middle of paragraph 15 (the Chief of Engineer's Report), "That it is recommended the construction"—he is there referring to the report of the Board of Engineers for Rivers and Harbors, who had examined the District Engineer's report and recommendation and the Division engineer's report and recommendations on this project. It recommends the construction of the Bluestone
1777 reservoir in the interest of flood control, navigation and power production in accordance with plans prepared under the direction of the Chief of Engineers, and approved by him, at a total estimated cost of $12,942,000, provided a definite agreement is entered into before the construction is begun for the disposal of the power at prices and under conditions that, in the opinion of the Secretary of War, will fully protect the public interest.

Q. What is the gross capacity of this reservoir according to that?

A. The gross capacity of this reservoir, according to that, is 625,600 acre-feet.

By Mr. THOMPSON:

Q. What will be the capacity of this reservoir for flood control?

A. May I refer to my answer? 625,600 acre feet.

Q. That is what you had?

A. That is right.

Q. What will be the capacity of the reserve in this reservoir for flood control?

A. The capacity for flood control within the reservoir, that volume above a height of 120 feet or head in the reservoir [the capacity reserved for flood control], will be 235,500 acre-feet, approximately.

Mr. JACKSON. Have you the page?

WITNESS. It does not definitely state this capacity. They give the capacity for specific elevations, but it is page 111 that we were on.

By Mr. THOMPSON:

Q. What are the uses to be made of the remaining storage capacity within the reservoir?

A. The next lower five feet below the bottom of the volume of reservoir reserved for flood control will have a capacity of 32,700 acre feet, and will be reserved for the reception of freshets. The next 50 feet lower, which goes down to a head of 66 feet, is known as draft storage capacity, and has a capacity of 235,300

acre feet. Below that, there will remain about 122,100 acre feet, if I recall correctly, of dead storage capacity, which is not usable.

1778 Q. From the sources of information to which you refer, from the Geological Survey reports, what is the lowest flow of record at the Bluestone dam site?

A. About 610 cubic feet per second. Should I refer to the page which gives this figure?

By Mr. THOMPSON:

Q. How far above Bluestone dam is the Radford project located?

A. As I recall it, about 90 miles. I will check myself on that figure.

Q. About 86 miles, isn't it?

A. 86 miles; yes.

Q. Mr. Johnson, have you ever made any study as to what effect the cutting off of the flow from the Radford project would have on the conditions under which the Bluestone operates, namely, allowing a minimum discharge of 2,000 second feet?

A. Yes; I have.

Q. In making this study, I desire to call attention at this time to Government Exhibit 97, and ask you if you have considered in your study a paragraph on page 5 of Government Exhibit 97, namely, the report of General Taylor, of December 29, 1925, which I read to you: "It may be assumed as a possibility that the plant"—may I interpolate the Radford plant,—"closes down completely for an indefinite period of time during a dry season and at times when the storage above the dam had been drawn down. In the combination of circumstances, all water from the drainage area above the dam would be shut off until the reservoir filled or until operations were resumed." Did you consider that statement in the preparation of your study?

A. Yes; I did.

Q. I also call your attention to paragraph 3, page 233, of plaintiff's Exhibit No. 156, which reads as follows: "That the construction and operation of the proposed dam"—by the

1779 way, your Honor, this is the license from the State of Virginia that I am reading from, "that the construction and operation of the proposed dam and power station shall be such that as at all times to prevent the unreasonable interference with stream flow and to minimize as far as practical and consistent with the reasonable use of the stream, interference, obstruction and impairment of the stream flow, and the licensee shall, unless a smaller quantity be hereafter authorized by this Commission, discharge not less than 25 cubic feet of water per

second, and not less than a total of fifty million gallons of water in each 24-hour period, and not less than a total of one billion gallons of water in each weekly period, provided that whenever and so long as the amount of water in New River a mile immediately below the mouth of Little River shall be at least as much as would be produced at such point by the release at the dam of 25 cubic feet per second, and not less than a total of fifty million gallons of water in each 24-hour period, and not less than a total of one billion gallons of water in each weekly period, if there were no other source of supply, the licensee hereunder shall be relieved of the obligation and duty of releasing or discharging any water of any more than a sufficient quantity to constitute the minimum flow below the mouth of Little River that would be produced at the same point by a discharge of 25 cubic feet per second and not less than a total of fifty million gallons of water in each 24-hour period and not less than a total of one billion gallons of water in each weekly period at the dam if there were no other source of supply at all at the particular time." Did you take that into consideration in your study?

A. Yes.

Mr. JACKSON. I object to the question as incompetent and immaterial. It can have no purpose whatever unless it is an attempt to ask his witness to construe the license of the State of Virginia. The only possible purpose counsel can have in asking that question whether he took that into consideration is to draw that question and the answer to it into a hypothetical question. I object to it as it is not the proper method of examining a witness on direct anyhow—whether he considers the terms of the Virginia State License.

Mr. THOMPSON. I asked if he took those two things into consideration in the study which he made.

Mr. JACKSON. It is utterly irrelevant unless he is going to interpret the conditions of the Virginia License, and, if he is going to interpret the conditions of the Virginia License impliedly, without bringing it to the attention of the Court, it is obviously improper.

The COURT. The Virginia license does not provide for the discharge of water at a minimum, but this question is whether or not, considering the effect of the shut-down on water supply at Radford, in the answer which he now proposes to make he took into consideration and made allowance for a minimum discharge, as allowed in the Virginia License?

Mr. THOMPSON. That is right.

The COURT. I think that is admissible.

Mr. JACKSON. We can see nothing more in it than a construction of the license. I do not want to argue the construction of

that license at this time unless the Court desires it, but the construction of it is entirely different from what has been referred to in this case. I presumed the time to argue that would be when the Court hears argument on the case. I shall be sorry to see the witness interpreting the terms of that license and undertaking to give testimony that involves the interpretation of the license. I can think of no more dangerous way to try to interpret it than by a hypothetical question to the witness as to what effect would be produced on Bluestone by the operation of the Radford plan.

Mr. THOMPSON. Counsel is trying to anticipate what we are going to ask the witness.

The COURT:

Let me ask him this:

Q. The answer which you are about to give, what figure did you consider as being the discharge from the Radford dam?

A. For a dry season, I considered the figures that were permitted under the State License of Virginia.

Q. When you went to figure and knew you had to use definite figures, what definite figures did you use?

A. The figures I used were such that the discharges would be within the limitations provided by the Virginia State License, which were, whenever that and so long as the discharge from Little River just below the Radford dam site shall always exceed 25 cubic feet per second, and shall average 77 cubic feet a second for a twenty four hour period or average 221 C F S for a 7 day period, they could impound the entire flow of New River.

Q. I want to get back to the original question, the answer as to which has he taken those things into consideration.

Mr. JACKSON. I do not think he has answered that question.

The COURT. Yes, he has.

Mr. JACKSON. I did not so understand it.

NOTE.—The testimony was read.

The COURT. "What effect would the cutting off of the Radford dam have on Bluestone?"

Mr. THOMPSON. Yes, and I asked if he had taken into consideration two things which I have named.

The COURT. If he took into consideration those things?

Mr. THOMPSON. Yes, sir.

The COURT. I will let your ask him another question first.

Mr. THOMPSON. I will ask him to demonstrate this to this point.

Mr. JACKSON. Is my objection overruled, or is it held in abeyance?

Mr. THOMPSON. I want, first of all, by preliminary to incorporate the limits by which this study is going to be demonstrated.

1780 The COURT:

What I want to know is, in arriving at the result of that study, you had to take into consideration some flow of water above Bluestone, either for that for which the Virginia License prescribed must be discharged from the Radford dam, or that coming from Little River. He must take into consideration some definite figures.

WITNESS. I did.

The COURT. I want to know what figures you did take into consideration.

WITNESS. Your Honor, I took into consideration just what the actual flows were for the dry year of 1930, for the Little River, for the discharge passing Radford and all tributaries discharging water into the river above the Bluestone dam site. I took into consideration the actual flows that existed during 1930.

Mr. THOMPSON. We are taking a concrete case and applying it to an assumed case.

Mr. JACKSON. We have no objection to any variety of assumptions that these gentlemen want to make as to flow of water, but we do have objection to questions that undertake to interpret the Virginia License.

Mr. THOMPSON. We are not trying to interpret the Virginia License.

Mr. JACKSON. Wait a minute.

Mr. THOMPSON. But you repeated that four times.

Mr. JACKSON. The hypothesis upon which the question depends should be stated, and those conditions to which counsel constantly refers are merely part of the conditions—to provide adequate water for stock and other things. You may have an immense amount of water, but the State of Virginia wanted to be sure that there would be always plenty of water. It is the particular conditions involved, and there are other conditions in the license. I cannot imagine that it would be helpful to the Court to ask this witness to interpret these conditions without stating the hypothesis upon which it depends.

The COURT. If you read the answer over, he has taken certain figures which he has outlined, and I want to know what those figures are.

WITNESS. Do I understand your Honor that you are not clear on what the figures are?

The COURT. You have not stated them. I heard you when you read them from the license.

Mr. THOMPSON. Does your Honor understand what the fifty million gallons of water means in basing a point in second feet?

The COURT. I don't know that I have it exactly

Mr. THOMPSON. Then I will ask this question.

Mr. JACKSON. Please note our exception.

1781 Q. What does 50,000,000 gallons of water equal passing a certain point in twenty-four hours?

A. It is approximately 77.36 c. f. s.

Q. And what does one billion gallons of water passing a certain point within seven days or a week equal?

A. Approximately 221 c. f. s.

Q. And when you are considering these figures you consider rather in second feet than in gallons, do you not?

A. Exactly so.

Q. Have you prepared a chart with respect to the study you have made?

A. I have.

Q. Have you got that chart here?

A. Yes, sir.

Q. I hand you, marked for Identification, Government Exhibit #204, which is entitled "Illustrating how the Radford project could affect operating results of the Bluestone development," and I will ask you what that is?

A. This is a diagram which was prepared at my direction to illustrate how the Radford project could affect operating results at the Bluestone development.

(Exhibit 204 offered in evidence over defendant's objection that said exhibit should not be admitted until after proof as to the nature of the exhibit had been adduced.)

Q. Will you please tell us what there is on that chart up in the upper right hand corner?

A. In the upper right-hand corner are listed, or tabulated, the principal features, the important features, physical features, of the Bluestone project.

Q. What is down in the right-hand corner, the middle?

A. The principal features, the important physical features, of the Radford project of the Appalachian Electric Power Company.

Q. What is the river that is indicated there?

1782 A. On the map there is a river shown in map plan, which shows at or near the upper right-hand end, the Radford dam site, with its reservoir extending upstream approximately to Allisonia.

In the lower downstream end toward the left is shown the dam site of the Bluestone project, and behind that its reservoir. The reservoirs are colored in green on the map.

A. And what is the scale of the map?

A. The scale is as shown. I forget just what it is, but it speaks for itself.

Q. You have here on the left-hand side "Log of Operations"—will you read what that states?

A. "Log of Operations—Based upon actual river flow records for the period of June 24 to December 6, inclusive, 1930, when the flow of the New River at the Bluestone dam site averaged less than 2049 C. F. S. for each consecutive week."

Q. Will you please tell the Court what these colors mean on this chart?

A. Referring to the profile——[interrupted].

Q. That is the Bluestone——

A. (Continuing.) We will see we have the Radford reservoir shown in profile, then the line that connects the Radford reservoir with the reservoir below and to the left, which is the Bluestone reservoir section, colored in green, getting back to the Radford reservoir represents 27 feet of usable draft storage capacity for that reservoir.

The section of reservoir colored in blue represents dead storage capacity, which is not usable.

In the Bluestone reservoir, that not colored, the upper 30 feet, is reserved for flood control, and the next lower 5 feet, which is also not colored is a space reserved for reception of freshets.

1783 Q. What is the green?

A. The green is the next 49 feet, shown in green, usable draft storage, and that below in blue is dead storage capacity which is not usable.

Q. In these reservoir representations you have here, as I understand it, the white represents that which is reserved for flood control in the Bluestone, and the green represents the usable storage, and the blue represents the dead storage, is that correct?

A. The blue represents dead storage which is not usable.

Q. Under the "Log of Operations" there are first of all the Radford dam site represented on the right hand side and the Bluestone on the left hand side, and your colors there, the empty part is represented by white, is that correct?

A. That is right.

Q. And when it is full that is represented by glue or green?

A. Green, the part represented in green is shown as water.

Q. Now the blue is dead storage in each instance, is that correct?

A. That is right.

Q. Will you take this illustration and explain to the Court what the effect of the Radford project would be under the con-

ditions you have set forth there, on the operations at the Bluestone project?

A. The year 1930 was a dry year. The flows very early in 1930 above the Radford dam site fell below and considerably below the average annual flows, so that by June 23rd there had been a considerable period of drought already, and of low flow in that river.

Q. May I interrupt to ask if you are assuming at this period and the dates that are on here the Radford project and the Bluestone were constructed and operating?

A. I am assuming they were constructed and operating for by the laws of probability a similar dry year will occur.

1784 Q. Proceed.

A. If the Radford project had been operating as it normally would, namely to drawn down its usable draft storage in dry periods, by June 23rd it could easily have exhausted its reservoir capacity, and the probabilities are very convincing it would have, because the flow beginning as early as in April was far below the normal.

Q. What do you mean by the normal?

A. The average annual flow.

Q. 3,200 feet approximately?

A. Yes, sir.

Q. Proceed.

A. So that I am abundantly justified and can justify the statement, or basic assumption, made here on June 23rd the Radford reservoir will have been emptied of its usable storage, and that beginning June 24th it would close the gates to refill. So we take June 23rd the Radford reservoir is emptied of its draft storage and the Bluestone reservoir on that date is full to the upper limit of its draft storage capacity. The operations of the Bluestone, under a proper rule of operation, based upon the records of the river, in which large or great weight is given to the dry year of 1930, in fact it is actually based upon the record of 1930, would not have begun to draw water down until the flow of the river dropped below, or approximately below, the 2,000 cubic feet per second, and from June 24th to August 24th, inclusive, for sixty-two days, the Radford reservoir, would have been refilling, the Bluestone reservoir would have been releasing 2,049 cubic feet per second.

Q. Why do you say that 2,049 cubic feet per second?

A. It so happens the Bluestone could have regulated to that minimum flow instead of exactly 2,000 cubic feet per second, using its usable draft storage, plus the natural flow into

1785 the Bluestone, if it had not been interfered with.

The average flow entering the Radford reservoir was about 881 cubic feet per second for this sixty-two day period, and the average discharge from Radford reservoir was about 69 cubic feet per second.

This, your Honor, was to comply with the conditions of the Virginia state license.

During that period the Little River fell 68 cubic feet per second short of the weekly requirements of 221 cubic feet per second.

The average flow entering the Bluestone reservoir was about 460 cubic feet per second.

On August 24th the Radford reservoir was full and ready to begin its draw-down.

The draft storage in the Bluestone reservoir at that time was about, or would have been, about 48,000—48,204 acre feet, indicated by the green space.

August 25th to September 16th, inclusive, twenty-three days, the average discharge from the Radford reservoir was 3,008 cubic feet per second.

The discharge from the Bluestone reservoir was 2,049 cubic feet per second.

Average flow entering Radford reservoir for this period about 818 c. f. s.

Average flow entering the Bluestone reservoir about 3,500 c. f. s.

On September 16th the Radford reservoir has again been emptied and ready to begin refilling.

Q. May I interrupt you there? The Radford reservoir all that time would be discharging that figure you gave above, about 3,008 second-feet?

A. That is right.

Q. Proceed.

1786 By the COURT:

Where do you get that figure 3,008 cubic feet per second?

A. Your Honor, I took that figure, assumed that figure, that was approximately 30% load factor for the Radford project. I assumed the Radford project would be operating on a 30% load factor, which would result in 3,008 cubic feet per second, approximately.

By the COURT:

What do you mean by 30% load factor?

A. For approximately 30% of the time it could operate its wheels at a discharge of 9,000 cubic feet per second.

By the COURT:

You mean they would be operating at a rate which represented about 30% of that full hydraulic capacity?

A. Approximately that, something of that sort. I don't remember exactly. And I assumed the same would have emptied the Radford reservoir before the beginning of the period when the Bluestone would have been required to have begun releasing to regulate the flow to 2,000 cubic feet per second, that is before June 23rd.

On September 16th the Radford reservoir emptied and was ready to begin refilling.

The draft storage in the Bluestone reservoir, that is remaining draft storage, about 115,020 acre feet.

September 17th to October 21st, inclusive, thirty-five days, Radford reservoir refilling, Bluestone releasing water, at the rate of 2,049 cubic feet per second.

Average flow entering Radford reservoir about 830 cubic feet per second.

Average discharge from Radford reservoir about 82 cubic feet per second.

Average flow entering Bluestone reservoir about 394 c. f. s.

October 21st the Bluestone reservoir has now become emptied of draft storage.

1787 The draft storage in the Radford reservoir about 52,350 acre feet.

October 22nd to November 16th, inclusive, twenty-six days, the Radford project continues impounding water, the average discharge from the Radford reservoir during this period is about 34 cubic feet per second.

The Bluestone is compelled to reduce discharge from 2,049 cubic feet per second to a quantity equal to the flow into the Bluestone reservoir, which for the remaining twenty-six day period required to complete the refilling of the Radford reservoir averaged only about 409 cubic feet per second.

If there had been no impounding of water in the Radford reservoir the Bluestone reservoir on October 21st would have had about 52,350 acre feet of draft storage remaining, which would have enabled it to continue the constant release of 2,049 c. f. s. up to and including December 6th. At December 6th the natural flow of the river at the Bluestone Dam site was increased to an average in excess of 2,049 cubic feet per second, by the rain fall which terminated the drought.

By the COURT:

Q. If on October 21st there had been no impounding of water, in the Radford reservoir and the Bluestone had about 52,350 acre feet of draft storage remaining, you say that this would have enabled it to continue the constant release of 2,049 cubic feet per second up to and including December 6th. But 52,350 acre feet

vouldn't permit the discharge of over 2,000 cubic feet per second
rom October 21st to December 6th, would it?

A. That would have been supplemented by the natural flow into
he Bluestone reservoir, which would have enabled the Bluestone
o continue its regulated discharge of 2,049 cubic feet per
second.

788 By the COURT:

Q. Been supplemented by only 409 cubic feet per second,
ccording to your own figure there. 52,350 acre feet of water
unning off at the rate of over 2,000 cubic feet per second would
mpty in about two weeks. You are supplementing that by less
han 20% increase.

A. There would have been a larger amount, this, I believe was
he flow into——[interrupted].

Q. I was thinking you said Bluestone was compelled to reduce
ts discharge from 52,350 to a quantity equal to a flow into the
Bluestone reservoir, which for the twenty-six day period averaged
bout 409 cubic feet per second.

A. Your Honor, I should have explained that in addition to
he 409 cubic feet per second that was contributed by the drain-
ge area below the Radford dam site while the Radford dam was
mpounding (interrupted).

Q Well that 409——

A. There was a much larger amount flowing.

Q. 409 added to your 52,350 acre feet looks to me like that would
in you down in less than three weeks.

A. You must add more than 409, you must add that which is
owing into the Radford reservoir also, there was a flow into the
adford reservoir at the same time, which would have been
vailable to the Bluestone.

Q. Which was about what?

A. About 954 cubic feet per second, your Honor, at Radford.

By Mr. THOMPSON:

Q. Now, Mr. Johnson, what effect would such a reduction on the
ow from the Bluestone reservoir have on conditions down below,
the Kanawha River?

By Mr. JACKSON. What kind of conditions?

By Mr. THOMPSON. You don't want me to say navigation, you
ave got me scared on that, but I will say navigable conditions if
ou wish it.

By Mr. JACKSON. I object to the competency of the witness to
swer the question.

Objection overruled. Defendant excepts.

A. It would increase—one minute, may I ask that the question
read.

By Mr. THOMPSON. Read the question. [Question read.]

By Mr. THOMPSON. Answer the question—navigable conditions?

A. It would be insufficient to meet the requirements for navigation on New River.

Q. On the New River; I said on the Kanawha River? What would be the reduction in flow from what the Bluestone was under such conditions flowing or discharging?

1789 A. From 2,049 to a figure of 409.

Q. What is that difference?

A. A reduction of 1,640 cubic feet per second.

Q. And you have testified as to the effect on navigation below?

A. I have testified——

By Mr. JACKSON. We object to the competency of the witness if he is going to testify any further in regard to navigation.

Objection overruled. Defendant excepts.

A. That it might have an adverse effect on navigation below.

Q. And by "below" what do you mean?

A. All the way down the New River, and possibly in the Kanawha River, and possibly it might affect navigable conditions in the Ohio River.

Q. Mr. Johnson, I believe you gave your figure, 2,049, did you not?

A. Yes, sir.

Q. After the subtraction what would be the reduction in flow?

A. I think I stated 1,640.

Q. What effect would such reduction during periods that you have described, due to the cutting off of the Radford project, have upon production of prime power at the Bluestone reservoir?

By Mr. JACKSON. Your Honor understands that we are objecting to this evidence for reasons heretofore stated.

By the COURT:

I understand, but I am letting it in for the present.

A. It would have a very profound effect, it would reduce the primary power by the amount of reduction in flow, approximately.

Q. In percentage what would it reduce it?

A. It would reduce it approximately 80 per cent.

By the COURT:

Q. I notice in making up this chart of yours you started on June 23rd. Why was that the date on which you started?

A. On June 23rd the natural flow at the Bluestone project fell to from above 2,049 you see to below the 2,049, and that was the date that the Bluestone had to begin its regulation.

Q. What was the flow at Radford, at that time, do you know?

A. Just at the moment I cannot recall from memory, but I can look it up.

1790 Q. I wondered why you started on that date with the Radford dam empty?

A. There had been a dry period, as dry as occurred in a number of years before June 23rd, certainly dry enough or as dry as there is, for justification for the premise, in view of General Taylor's letter, that they would have exhausted their useable provided storage by that time.

Q. It was not any more dry than the pool at Bluestone, was it?

A. Bluestone would operate under a very definite rule curve, and that rule curve is that the water will be released, and when released they will begin the use of the provided storage capacity until or when the flow falls below 2,049 or 2,000 cubic feet per second, predetermines the amount to which the river is to be regulated.

Q. On June 23, it had not fallen below that?

A. No, sir.

Q. Why did it fall so much below at Radford?

A. At Radford they have a relatively larger installed capacity and will have at that time, so that making use of only one-third of their daily possible capacity, which would be to operate the machine three times as long as I have assumed they did, they still would have to discharge all of that draft storage in addition to the water flowing into their reservoir prior to June 23rd, they would only have had to use approximately one-third of their continuous capacity to have accomplished that.

Q. How low does the flow of the stream have to get before the Radford dam begins to lower its pool level?

A. I assume that the Radford dam would lower their water whenever the stream flow is such that it does not suffice to meet their customary power demands.

Q. And that is going to be what figure, or what figure did you take for that?

1791 A. What the exact demands are, it is assumed their demands will be approximately one-third of their full daily generating capacity, I would say that as a fair figure.

Q. Then you assume that the Radford pool starts to lower whenever the flow in the Radford Dam got below 3,000 feet?

A. Exactly so, the average annual flow. I might explain that. The average annual flow into the Radford reservoir is in excess of 3,000 cubic feet per second, so that if they were continuously operated and drawing 3,000 cubic feet per second, or approximately that, it would not very often occur that they would ever reach the bottom of their useable draft, because before they had gone that far rains would have ordinarily come along to replenish it or refill the reservoir, but in the instance such as we have taken for the year 1930, and for exceptionally dry years,

that rule would be broken, that is, when they go to that 27 feet of draft then obviously the only thing to do, or there would be such a small trickle of water passing that there would be very little power, something like 1,880 cubic feet per second, would be generated at this greatly reduced head, and it would compel them to make use of some auxiliary power to supply that needed, it may be some retired steam capacity, or some steam capacity that is not very efficient to use, that has aged a good deal, that is held as a reserve capacity, or it might be they would get it elsewhere within their system. That, I do not know, but it would be better for them to do so and close their reservoir after having exhausted this draft storage in the midst of a very long dry season, to refill, because in doing so, they would generate more power from that reservoir. Of course, it would not be good economics to continue to operate at the very low level they have drawn it down to, that is determined by their lowest level after the 27-foot draw-down, and with a very small stream flow coming in. If they filled the reservoir of course they get the benefit of a high head, and then they could close down their steam plant,

1792 and use that after filling the reservoir, with the probability that before that was exhausted they would not have to start their steam plant again, and the difference between continuously operating, that is, just as a matter of power, they could generate, and the filling of the reservoir or just one reservoir filling alone, if you evaluate at four mills—Let us see what that would amount to—that would be something over, as I roughly estimated, $5,000, and that would be, in addition to other reasons, an incentive to fill it.

Cross-examination by Mr. JACKSON:

Q. Mr. Johnson, you testified that in your opinion the lag between the Radford dam site and Kanawha Falls at low water is about three days?

A. Yes, sir; with very low water.

Q. And you were referred to a date?

A. One moment—perhaps I did not get the question. The Radford dam site to what—Kanawha Falls?

Q. Yes; that is my understanding.

A. Yes, sir; or to Kanawha Falls; it is an approximate figure; as a matter of fact, between two or three.

Q. You said three days; do you change that?

A. Yes, sir; I say three is the proper figure. Closer to three days. I think that is the proper figure to use.

Q. You were referred to a date in October 1930 when you say that the Water Supply papers show at Kanawha Falls an average flow that day of 1,143 second-feet?

A. Yes, sir.

Q. And you gave a corresponding flow at the Radford dam site of 763 second-feet. Isn't it a fact that the flow of 763 second-feet at the Radford dam site occurred only two days before the reading at Kanawha Falls?

A. No; it is my information that it occurred three days.

By Mr. THOMPSON. Now, Mr. Johnson, I ask you whether it is possible to develop navigation in the 50 miles or more that is covered by the distance between Hinton and Kanawha Falls, of the type as described by Chief Justice Marshall.

By Mr. JACKSON. I object to the form of the question, as entirely an improper form on direct examination, to read a volume to a witness and ask him whether he agrees with it, or what comments he wishes to make upon it.

By Mr. THOMPSON. I didn't ask him if he agreed to it.

By Mr. JACKSON. I object further to the competency of the witness to answer any question respecting the improvement of navigation.

I object to the question because it is entirely irrelevant and immaterial. I think it is highly improper to have this witness commenting upon these documents that are before the Court, and particularly to have him construing them and laying down possible methods of navigation.

By the COURT. I think it is largely immaterial. All this witness, if he knows, can say, is that you could do what Chief Justice Marshall said you could do.

By Mr. JACKSON. Of course, I don't know what the witness is going to say and I have to make my objections now.

By the COURT. What you mean is, this witness having been through the river, did he say anything to cause him to think that Chief Justice Marshall did not know what he was talking about. That is about it, is it not?

By Mr. THOMPSON:

I have a step further to go in urging this testimony, and I want to ask the witness if that was feasible normally for that time being?

A. It was.

Q. You would not recommend it at this time, would you?

By Mr. JACKSON. I object to the competency of the witness and the immateriality of it.

A. No, sir.

(Objection overruled. Defendant excepts.)

By Mr. THOMPSON:

Q. Now I believe you said you have read and studied the Moore-Briggs Report to the Board of Public Works of the Commonwealth of Virginia?

A. Yes, sir.

Q. How far does that survey go up New River, if you remember?

A. It extended to the mouth of Sinking Creek, up to Sinking Creek a distance of 54 miles above the mouth of Greenbrier.

Q. Have you the figures and items set forth in the pages of that report?

A. Yes, sir.

Q. What would you say as to the feasibility or non-feasibility of the proposed improvement of navigation set forth in that report covering the stretch between Sinking Creek and Kanawha Falls?

By Mr. JACKSON. I certainly object to that question.

By the COURT:

What does that report set forth?

A. It sets forth the whole engineering system in great detail as to how to make that river navigable so far as their times were, concerned.

By Mr. JACKSON. I object to the competency of the witness to speak on that question and the materiality of the evidence.

By the COURT. He may be competent to testify whether an engineer feels it was possible of accomplishment. The reason I asked what was in the report was, it suggests the construction of certain locks or dams. From an engineering standpoint alone he wants to know if the improvements suggested are feasible.

By Mr. JACKSON. Of course, my objection is to the competency of the witness to testify in regard to any purported method of improving the river for navigation.

By the COURT:

He is an engineer and he may be able to testify in regard to it.

Defendant excepts.

A. It is my opinion, that the proposed project for which Moore and Briggs submitted estimates was entirely feasible.

Q. You would not advocate that system at this time, would you.

A. I would not advocate the improvements, employing the same identical system at this time. Nowadays, we would use much more modern machinery, much more improved methods of improvement of waterways, making it serve more than just one purpose, navigation alone. We would incorporate in the improvement that of flood control and power along with navigation. By so doing the pools of the river would create slack water, and rather than rely upon open river navigation, improvements, just for open river navigation alone, which would enable ships of decidedly heavier tonnage, barges as well, to pass much more rapidly up and down the river, or navigate

the river much more rapidly, and at very much more lower cost, than would be possible in the open river or sluice navigation, which was contemplated by Moore and Briggs and Chief Justice Marshall.

By Mr. JACKSON. I move to strike out so much of the answer as purports to tell what you could do or what you might do, or what might happen in the way of surveying a navigation picture on the ground that the witness is wholly incompetent to testify on that subject.

By the COURT. He has testified to what the customary method of improvements is now.

Defendant excepts.

By Mr. THOMPSON. I desire to say at this point that in referring to the Moore-Briggs Report, it is Government Exhibit 32, and is already in evidence.

By the COURT. You have asked the witness if the matters in the Moore and Briggs Report and in the report of Chief Justice Marshall were not such matters as he would recommend at the present time, and he said no. Now from the standpoint of navigation, pure and simple, taking nothing else into consideration, do you, Mr. Johnson, believe that the improvement of New River, above its mouth, the expenditure of money in the attempt to make that a canalized navigable stream, would be justified, purely from the standpoint of commerce, to be borne on that stream.

By Mr. THOMPSON. Do you mean all the way up the river to Hinton and then by the James River and Kanawha Canal?

By the COURT. I am talking about up this river, not about the James River, or the Kanawha Canal.

By the WITNESS. Let me ask Your Honor if you mean to do that for navigation alone?

By the COURT:

Absolutely for navigation alone.

A. You would exclude production of any power in doing so?

Q. Yes, sir.

A. Would you exclude flood control, too?

Q. Yes—eliminating any question of flood control—and you approach it from this point of view, take the river from its mouth up, we will say to Allisonia. Now considering the practicability and potentiality of that stream as an avenue of Commerce, and nothing but from that standpoint, as an avenue of commerce, do you think the improvement of it by a series of dams and locks would be justified?

A. Your Honor, if a sufficiently large tonnage were assured, it would be justified, just as a commerce carrier.

Q. Of course it would if a sufficiently large tonnage of commerce was secured.

A. I mean to say it could be shown, I feel quite confident of this, although I am expressing my opinion, and giving you my opinion, I have not the computations to entirely justify what I am saying, but it is my opinion, if there were sufficient commerce, say up to a maximum of thirty million tons per year, which would be in excess of the normal capacity of any railroad that I know of——

Q. One minute, do you know where that commerce would originate on New River?

A. In the form of coal perhaps. There is an immense amount of coal, and possibly in the form of some other ore, as I understand there are some valuable ores in that territory.

Q. Where is that coal above Radford?

A. There may not be coal just above Radford, but there might be hidden the transport of coal possibly, not very far below Radford, and below Hinton.

Q. I am not going to get into any discussion as to the possibility of sending thirty million tons of coal down the river, but the reason I was asking you the question was, because you stated in answer to a question from Mr. Thompson, that you would not recommend certain things at this time and day, leaving the impression that you might recommend a development by other ways of navigation at this time. As I understand this 308 Report of the Chief of Engineers he states very clearly that the Kanawha River and its tributaries have no potential value for purposes of navigation, at least that is what I understood him to say. I want to know if you agree with that?

A. I do not agree with that.

By Mr. THOMPSON. Your Honor, are you sure you have read that correctly, the 308 Report of Major General Markham's Report there?

By the COURT. Where is that?

By Mr. THOMPSON. That is on page 11.

By the COURT. "Because of their unfavorable natural characteristics (steep slope and tortuous alignment) none of the tributaries of Kanawha River offer potentialities for development in the interest of modern navigation". I just wanted to know whether the witness agrees with that.

By Mr. THOMPSON. Isn't that a report of a subordinate? You will find that Major General Markham's Report overrides the report of subordinates in most every instance.

By the COURT:

That is a letter from Col. Spaulding to the Chief of Engineers. I don't know whether the chief agreed with that or not. I hap-

ed to notice that statement in there, and I wanted to know if witness agreed to it.

A. Your Honor, I do not agree with that statement.

Q. Is that all, Mr. Thompson?

By Mr. THOMPSON. We reserve the right to recall him on the er matter we discussed.

By Mr. JACKSON. Mr. Johnson, you testified from—that from tember, 1934, to July 1st, 1936, you were a special assistant to Attorney General of the Department of Justice of the United tes?

A. That is right.

Q. Are you—you are not a lawyer, are you?

A. No, sir.

Q. Is it not a fact that you were merely a special investigator the Department of Justice during that period? Is that right?

A. I was an engineer with that designation.

Q. You carried an appointment with the Department of Justice Special Assistant to the Attorney General? Is that correct?

A. Yes, sir; that is right.

Q. And you devoted all of your time to working on those two suits that you mentioned?

A. Yes, sir.

Q. Mr. Johnson, I think you said you operated the power sta- n at Wilson dam for a while; is that right?

A. That is right.

Q. You were Superintendent, were you?

A. I was Assistant Superintendent and in the absence of the perintendent, I was in charge.

Q. Who was in charge as Superintendent?

A. While I was there at Wilson dam, a Mr. N. B. Ambler was perintendent.

Q. And he was under the officer of the Corps of Engineers of United States Army, who had responsible charge of that?

A. That is right, yes, sir.

Q. What was the maximum draw down on the pool at Wilson n for power purposes, when you were there?

A. It was nothing.

Q. It was nothing?

A. Noth ng.

Q. Did ou ever operate a hydro-electric reservoir plant, utiliz- a substantial amount of storage for draw down during low er season?

A. Yes, sir.

Q. Where?

A. The Dneiprostroy project in Russia on the Dneiper River.

Q. You are now going to be Manager of the Water Works Division?

A. No, I am manager of the Distribution system in the City of Florence, extending beyond into the surrounding area of Florence—Alabama.

Q. You testified on direct examination that you had observed a number of dams on New River, notably the Washington Mills dam, the Fries dam, Buck and Billesby, Hawks' Nest and Glen Ferries and perhaps others?

A. Whether or not I testified to exactly those that you mentioned, I can testify that I have.

Q. You could do that?

A. Yes, sir.

Q. Is there a Lock in any of these dams?

A. There is not.

Q. Now, Mr. Johnson, you offered in evidence here some charts bearing the designation "Preliminary Study, New River, Bluestone reservoir Project," marked Exhibits 200, 200-a and 200-b. Can you state whether or not Exhibit 200 and Exhibit 200-a are alternative preliminary studies for a Log Chute—a method of passing logs?

A. It is my opinion they are.

Q. Did you notice on Exhibit 200, for instance, the dotted lines bearing the legend "Future Flumes" and then on the left hand side, other dotted lines structures which bear the legend "Future work shown dotted" and below that different structures with the legend "Present work shown solid"?

A. I have the Exhibit before me and I will not ask you to repeat all, but if you will repeat the number of the Exhibits to which you——

Q. I referred only to No. 200.

A. And your question is?

Q. You see this, do you [indicating]?

A. I do.

Q. Isn't it a fact that the structures shown solid, indicate work that would be done at the time of construction, if this preliminary study were adopted and followed out, and the dotted and dashed lines indicate suggested possible construction at a later date?

A. Mr. Jackson, that is right, but this has to be done in order to reserve the space and to reserve within the facilities the possibilities of working these in later so that they will not—that other structures and devices will not encroach on the space reserved for this in the future.

Q. It is to make it possible to add these facilities at a future date, subsequent to the construction of the main project, with the minimum of expense, if desired?

A. It is so that, if desired, in building the plant, that they will not be precluded in the possibility of other installation. As a matter of fact, Mr. Jackson, I notice here that there will be some of these facilities installed at the time the dam is built, according to this drawing. [Indicating.]

Q. We are agreed that the dashed and dotted structures are future construction that may be constructed in the future, when and if needed?

A. It is that part shown dotted.

Q. And dashes?

A. Yes, sir; but that does not include the navigation facilities.

Q. Did you understand me to say anything about that?

A. I wanted it clear that I would understand it.

Q. I wondered if that was your only reason for volunteering that statement. Turn to Exhibit No. 200–a, which shows certain diagrams with reference to Pivoted Flumes and Log Cranes, and I will ask you whether or not it is also true in that drawing, that the dotted and dashed structures indicate merely provision for structures that may or may not be built at some future date, and the solid lines indicate structures to be built when and as the project is constructed, if this preliminary study should be adopted and followed out?

A. These structures shown dotted, according to this drawing, are for future construction, according to this drawing, which we know to be a preliminary drawing.

Q. I understand that it is nothing more than that. Now, I direct your attention to Exhibit 200–b—another sheet—preliminary study, which has some drawings on it in connection with Barge Lifts, and I ask you whether or not, similarly on that sheet, structures shown in dotted and dashed lines, indicate structures which may or may not be built at some future date, depending when, if at all, they shall be considered desirable, and the solid lines indicate those structures which would be built when the project is constructed, if this preliminary study is adopted?

A. That is right. It so states on the drawing. It does not state "if and when," but it states that this is for future installation. We assume when needed and provision is made for this installation.

Q. You also testified that, according to Government exhibit No. 145, the Bluestone reservoir would create a slack water pool for a distance of 36 miles upstream from the dam: Isn't it a fact that that condition could only obtain when, if and to the extent that the entire flood storage surcharge capacity of the reservoir—that is, the upper thirty feet reserved for flood control, should be entirely filled?

A. That will obtain when it is entirely filled.

Q. And only when it is entirely filled; is that right?

A. Substantially only when it is somewhere near that. I am not exact on the mileage, and neither will I be exact as to say it has to be entirely at the maximum upper elevation of this pool.

Q. You can be as exact as you were on direct examination—36 miles, can't you?

A. Did I say 36 or approximately 36?

Q. Well, whatever you said. Now, am I right in understanding that when and if the Bluestone project should be drawn down, so as to utilize the utilizable storage for power purposes, the maximum drawdown will leave a head of 66 feet? Is that right?

A. This project as—while it has no final determination of that—so far as I know, it has not been definitely made—the best information that the War Department say—that they can get at this time, is that the turbines have not been ordered and the characteristics have not been sufficiently determined to say with absolute positiveness, but it is understood that will be the lower limit of draught.

Q. You know, from your study of Government Exhibit No. 145 that the plans set forth there provide for a maximum drawdown, leaving a head of 66 feet, don't you?

A. Yes, sir.

By the COURT. At Bluestone?

By Mr. JACKSON:

Yes, sir.

Q. And that is necessary in order to get a regulated flow of 2,000 second-feet in low water season?

A. You get approximately that. Something slightly over that.

Q. If the Bluestone reservoir were drawn down to a head of 66 feet, the pool elevation would be 1,436, wouldn't it?

A. Yes, sir.

Q. And did you estimate how many miles upstream from the dam that elevation would provide a slack water pool?

A. Why, I can do that.

Q. Did you?

A. I have done that; I don't know that I testified to that.

Q. I do not suggest that you did. I noticed that you omitted it.

By the COURT. What is the number of this Exhibit?

By Mr. JACKSON. That was introduced generally by Mr. Winn and Colonel Watkins vouched for the placing of the pool levels on that exhibit and for the top of the flood storage for Blue-

e and for the top of the utilizable storage, but he drew a line how that if there was a maximum drawdown, the elevation he pool would be 1,436.
y the COURT. I was going by the coloring.
y Mr. JACKSON. I have that on the one here.
y Mr. THOMPSON. He said it was drawn as you stated it.
y Mr. JACKSON. He drew it to 1436.
y Mr. THOMPSON. He said he drew it as you suggested.
y Mr. JACKSON. He said it was 1436.
y the WITNESS. Mr. Jackson, I do not have it sufficiently accu—well, I do have—may I refer to the profile?
y Mr. JACKSON. Here is one [indicating].
Witness goes to map on pedestal in Court room and figures.)
y Mr. JACKSON. Your Honor asked for the number of the bit. It is No. 120—it is the one that shows the profile colored.
y the COURT. It shows dead storage to 90 feet—to be 90 feet?
y Mr. JACKSON. Yes, sir.
y Mr. JACKSON. We brought out that the dead storage would 436 with maximum draw down and he drew a line to show re that is.
y the WITNESS. Roughly—I could determine that with greater ision—but roughly I stated the pool—at Bluestone—to be ele- on 1436—wasn't that it?

By Mr. JACKSON:

es, sir.
. Would have a slack water length, not taking into account back water effects—
. Yes.
. (Continuing.) Of approximately 17½ miles.
y Mr. JACKSON. Mr. Thompson, I neglected to ask you, when offered Exhibit 204, if you offer that as proof of the location he State line?
y Mr. THOMPSON. No, sir.
y Mr. JACKSON. I am not sure that it was offered, as a matter of fact.
Q. What is the source of your information?
A. Water Supply Papers of the United States Geological vey.
. Give me the number of the paper and the page on which you for that.
. (Witness examines books and papers.) You spoke of a od in September—which is it now?
. October 1930?
. The month of October 1930. (Witness examines papers.)
. Just give me the number so that I can check it.

A. Yes, sir; I want to be sure that I am getting it right. Water Supply Paper—Mr. Jackson, the number of this paper (indicating) is 713, and it happens to be at the division between one year and the other, as the records are kept. If I correctly——

Q. I wanted to find out what corresponding——

A. You mentioned the Kanawha Falls, and I think in my testimony, I gave Lock No. 2, didn't I?

Q. I made a note of Kanawha Falls. I could not be sure about it.

A. The figures are 1143, and I believe that applied to Lock 2.

Q. I merely wanted the source of the data; if it is in that paper, it is satisfactory to me, unless you want to say something further.

A. At Kanawha Falls, it was 1130 cubic feet per second, to get it straight.

Q. You also offered in evidence some exhibits on which you undertook to locate certain old ferries. Did you get those off the Dublin Sheet, in part?

A. Where they referred to the survey of 1911—on those surveys prior to 1935—is that it?

Q. You testified that you got the locations of a number of ferries off of maps of the United States Geological Survey, and I am asking you whether or not you got part of those from the Dublin Sheet?

A. I am not clear as to whether or not we got some from
1794 the Dublin sheet or not. As to whether or not the Dublin sheet was used, I did not make a mental note in regard to the sheet.

Q. Are you familiar with the Dublin sheet?

A. I have seen it.

Q. I want to ask you a few questions about your Exhibit No. 204. On that exhibit, you show the Radford reservoir empty on June 23rd, 1930. Is that right?

A. Yes, sir.

Q. You are familiar with the fact that, as shown by the testimony of Colonel Watkins and Mr. Kramer, and I think of Mr. McWhorter, that the Radford project is designed to provide an average regulated flow of 1200 or 1236 second-feet in the extreme low water season?

A. The Radford reservoir is designed now—you say I am familiar with whose testimony—Kramer and Colonel Watkins and Mr. McWhorter?

Q. I said——

A. I am not familiar with all that testimony. I want the record clear on that.

Q. Are you familiar with the fact that the Radford reservoir is designed to provide an average regulated flow of 1200 or 1236 second-feet throughout an extremely low water season?

A. That it is designed for that purpose?

Q. Yes, sir.

A. I am not.

Q. You did not know that in preparing plaintiff's exhibit No. 204, did you.

A. I doubt that now.

Q. Whether or not you doubt it, you did not know anything about it when you prepared Plaintiff's Exhibit No. 204? Is that right?

A. Exactly so.

By Mr. JACKSON:

Q. How long ago did you prepare plaintiff's Exhibit 204?

1795 A. Plaintiff's Exhibit 204 was a preliminary draft of that exhibit, and it must have been made—the idea occurred, and possibly something was done on it, as far back as oh, September, I should say, of 1934—I mean to say 1935,—but it was finally completed—I will see the date: It is not shown. It was completed, I should say, about a month or six weeks ago.

Q. That long ago, do you think?

A. Yes, sir.

Q. But you say you do not now know that the Radford project is designed to provide an average flow of 1,200 or 1,230 second-feet throughout low water period?

A. That question is not clear to me. Are you asking me what would it be possible to accomplish with the approved storage capacity you have in the Radford reservoir and that would be made use of within certain limits of that reservoir?

Q. I am asking you whether you do not know now the Radford project is designed for an average flow of 1,200 or 1,230 second-feet throughout low water season?

A. No.

Q. You say the Radford reservoir emptied on June 23, 1930. Don't you know it to be a fact that the flow of New River, at the Radford dam site, did not fall below 1,230 second-feet before the 22nd of June, 1930?

A. Before the 22nd of June?

Q. Yes.

A. I don't recall just what the flows were—that is, the specific exact amounts of those flows at that time. I can look that up if you wish to have me verify it.

Q. There was no dropping of the flow really below 1,230 second-feet until after June 21, 1930. Do you know about that now?

A. I would have to look at the papers.

1796 Q. At least, you did not ascertain anything about that when you prepared this Exhibit 204?

A. I did not know that that particular question was coming on cross-examination. That is my explanation why I have not done that. That was not exactly pertinent. I did not have that much legal mind.

Q. I will show you a Water Supply Paper, No. 698, page 62, in June 1930, and ask you whether or not it was not June 21st before the flow at the Radford dam fell below 1,200 or 1,230 second feet and continued below that figure—June 22nd?

A. Whether it fell below 1250?

Q. 1200 or 1230, and continued generally below that figure?

A. That is all right.

By Mr. JACKSON:

Q. That is all right.

A. Yes.

Q. That would be just one day before June 23rd?

A. June 21st?

Q. June 22, the date when it dropped below?

A. Was it June 21 or 22, to be exact?

Q. I again show it to you. June 22, when it dropped below and continued?

A. Yes. It would be two days, because June 23 is inclusive.

Q. There would be some lag in low water flow between Radford and Bluestone, would there not?

A. If it would be extremely low water, it would be about three days.

Q. As I understand your direct testimony, the Bluestone project is operated on a rule curve, designed to provide an average flow of 2000 second feet through extreme low water; is that right?

A. To insure a minimum discharge in New River immediately below the Bluestone dam site of not less than 2000 cubic feet per second.

1797 Q. And that operation is based upon a rule curve, isn't it?

A. Yes; it would be based upon a rule curve.

Q. And that rule curve would be predicated upon an extreme low water year, like 1930; is that right?

A. Yes; that much of the rule curve—that determining the low flow regulation.

Q. And under operation by a rule curve, you regulate the draw-down of your reservoir in accordance with that curve so

that you will have that average amount available throughout that low water period; is that it?

A. Exactly so.

Q. Well now, assuming, Mr. Johnson, that the Radford reservoir or project had been built and in operation in 1930, and you were operating the Radford reservoir on a rule curve to provide an average flow of 1230 second feet throughout the extreme low water season, and assuming, as shown by your examination of the water supply papers, that the flow into Radford reservoir did not fall and stay below 1230 second feet until the 22nd of June, 1930, what would have been the condition of your reservoir on June 23, 1930?

A. You are assuming that the Radford reservoir, Mr. Jackson—it is a long involved question, and I want you to clear it.

Q. It will be read to you.

A. So I may understand you; before I answer this intelligently, I must understand you.

(Last question and answer were read.)

A. That is a hypothetical question, I take it, Mr. Jackson?

Q. It is hypothetical like your exhibit.

A. We are assuming the Radford reservoir will be operated in an entirely different manner from that I have shown in the exhibit?

1798 Q. I am sure that that is so.

A. I want to understand that. And that it is operated not within the limitations required by the State of Virginia License—not that at all?

Q. I would not know.

A. It would be operated in much the same proposition as Bluestone: It would accomplish two things—provide power and river regulation.

Q. I am asking you to assume it is operated under a rule curve?

A. I don't know exactly what kind of question I am answering. First of all, I don't know that the rule curve, of which you speak, would produce a regulated river below the Radford dam of 1,270 cubic feet, did you say?

Q. 1,200 to 1,230?

A. 1,200 to 1,230. To that extent my answer would be a guess.

Q. It is not any guess. I have given you the facts. All you ar responsible for is the answer.

A. I can even go further than that.

Q. But I don't want you to go further than that. I just want the answer.

A. I mean to say if operated according to a proper rule curve, the Radford reservoir could be made to assist the Bluestone and

to make it possible for the Bluestone to discharge a larger quantity of water in low flow years than 2,000 cubic feet per second.

Q. I will ask the reporter to read my question.

A. The question is what would have been the condition of the Bluestone reservoir?

Q. No; the Radford reservoir?

A. What would have been its condition? You will have to give me some time to investigate that. I can't answer that without some time.

Q. Mr. Johnson, do you mean to testify on the stand here that given the assumptions you are operating the Radford
1799 project in 1930 on a rule curve to provide 1,230 second feet average daily flow throughout the extreme low water season, and the fact the flow as you yourself verified in the Water Supply papers did not drop below 1,230 second feet, and stay below it until June 22, 1930, you cannot tell this Court what would be the condition of the Radford reservoir on June 23, 1930?

A. On June 23rd?

Q. Yes; one day later.

A. If you are operating it on a rule curve?

Q. Yes.

A. How could you; how am I to know unless I examine further, your Honor, into the Water Supply papers to see what drafts will be made from that reservoir prior, a week or a month before, and see if the reservoir could have been filled in the intervening time? I know the answer he expects me to give, but I cannot give that answer until I investigate.

By the COURT:

You mean the flow might not have been in operation for some weeks or months previous to that?

A. That is it. I have to know how it would be possible to have a reservoir full.

Q. Assuming in addition to what I have asked you to assume, assume that in accordance with any known, sane operation of a reservoir project, you would enter the low water season with a full reservoir and a rule curve to provide 1,230 c. f. s. throughout the extreme low water season, and you didn't fall below your rule curve figure until June 22, 1930, don't you know there would be no appreciable draw-down of that reservoir by June 23, 1930?

A. I cannot absolutely answer that question, because I do not know sufficiently well, don't recall sufficiently well, what the conditions were prior.

1800 Q. I told you the reservoir was full when you entered the low water season.

A. You said that, but if you make it a hypothetical question we will assume it is full.

Q. I made it a hypothetical question, like your Exhibit, and want you to answer it the same way.

A. I——

Q. Don't look at counsel, he isn't going to answer it for you.

By Mr. THOMPSON:

The exhibit isn't hypothetical.

A. When counsel speaks naturally my eyes turn to him I reserve the right to turn my neck.

Q. Due to your difficulties I will state another question. Assuming that in normal operation of a reservoir, on a rule curve, you would enter the low-water season, with a full reservoir, and assuming that you had been operating the Radford project in 1930 upon a rule curve to provide an average daily flow of 1230 second feet throughout the low water season, and assuming what you have yourself said, is a fact here on the stand, that the flow into the Radford reservoir did not fall and stay below 1230 c. f. s. until the 22nd of June, what would be the condition of the Radford reservoir on June 23, 1930?

A. Mr. Jackson, without seeming to evade your question—— [interrupted].

Q. There is no seeming, so far, go ahead.

A. I clearly am not trying to evade your question, but I contend that I cannot with certainty answer your question until I am more positive. While a hypothetical question it commits me to the proposition in a way. Your reservoir is drawn down to that point, I meant to say is full on June 23rd, or approximately full, it wouldn't be full, as you have indicated yourself, that much would not be true, that much of my testimony would be untrue.

1801 Q. I have assumed it is full.

A. We have taken two days anyway.

Q. I asked you what difference it would make?

A. Some difference.

Q. How much?

A. I don't know exactly. You have it before you.

Q. We haven't anything on a rule curve of 1230 second feet?

A. You have the Water Supply papers, records of that, and the discharge, you don't have it computed for the drainage area—Allisonia——[interrupted].

Q. You would not expect it to get any less between Allisonia and the Radford dam site, would you?

A. I normally wouldn't expect it to diminish but there are instances where it actually does.

Q. Just give us your answer please, how much would it be drawn down in the two days?

A. How much would the Radford dam be drawn down?

Q. Yes, you have your Water Supply paper and the rule curve of 1,230 second feet.

A. You want me to take 1,230 or 1,250?

Q. That is the figure isn't it, 1,230?

A. (After calculating.) I have used the gaging station and not the accurate flows passing the Radford dam site.

Q. You are using the flows above the Radford dam site at Allisonia?

A. Yes, sir, Allisonia, which is a gaging station upstream, somewhat from the Radford dam site.

Q. You want to make a reservation there may have been some difference before you got to Radford?

A. No, I don't think there normally would be.

Q. Give me the figures?

A. It indicates there would have been a reduction in the capacity of only about 660 acre feet.

1802 Q. On June 23rd or end of June 23rd?

A. I want to check that figure. [Witness calculated.] About 1,320 acre feet.

Q. Will you give me the flow for the 22nd and 23rd at Allisonia?

A. Flows for the 22nd and 23rd are 1,060 and 1,070, respectively.

Q. And the amount of draw-down would be the difference between those figures and 1,230, c. f. s. wouldn't it?

A. The amount of draw-down yes, the average flow for these two days was ½ of 2,130. [Witness calculated.]

Q. What do you now make it?

A. Now the average flow on those two days was 1,065. The discharge is 1,230. 165 is the difference in discharge, and for two days would be approximately 660 acre feet.

Q. Would that be about $\frac{6}{10}$ of 1% of the storage capacity of the reservoir?

A. About $\frac{66}{100}$.

Q. Of 1%?

A. Yes, sir.

Q. In this Exhibit #204 you assumed, as I understand you, that the Bluestone reservoir was operating on a rule curve of 2,049 second feet, average discharge throughout the low water season?

A. Yes; for the rule curve is based on performance for 1930, what could have been accomplished in 1930, if you made it exactly that, it would have established approximately 2,049.

Q. And you assumed that operation on that rule curve in this Exhibit #204 for Bluestone?

A. The War Department corps of engineers have established that it can regulate the flow of the river to a flow less than 2,000 cubic feet per second, so you get a minimum flow of not less than

2,000 cubic feet per second. In going through the actual computations of it I found it could have established a minimum flow for 1930 of 2,049.

1803 Q. You testified that Bluestone would be full on June 24, 1930, under the rule curve, or operations based upon 1930, didn't you?

A. Yes, sir.

Q. And the reason for that was that it was not until June 24, 1930 or thereafter that the average daily flow at Bluestone fell below the rule curve figure?

A. After the 23rd I believe I testified.

Q. Which ever it may be, right at that time?

A. Yes, sir.

Q. And the only reason for selecting that precise date was because of the application of the rule curve to the figures for run off or flow in the Water Supply papers?

A. That was the reason, no other reason was in mind.

Q. But you didn't apply any rule curve in fixing when the Radford reservoir would commence to empty, did you?

A. That wasn't absolutely necessary. You can start from that date and explore the Water Supply papers and going back you find the Radford reservoir would have been emptied, if it had operated to have emptied, and then in dry season, up until July 3rd, we already had had a period of low flow, and I examined the Water Supply papers, the flow back of that, to determine that the Radford reservoir would have been emptied upon the assumed flows we used.

Q. If you had assumed a still higher discharge you could have shown it empty sooner, couldn't you?

A. Oh, yes.

Q. And you assumed the Radford reservoir was being emptied prior to the entry upon the low water season, measured by the flow under the rule curve for which it was designed to operate throughout that season, didn't you?

A. You mean the Bluestone?

Q. No; the Radford.

A. The Radford was operating under a rule curve? I know nothing about any rule curve for the operation of the Radford project.

1804 Q. That has been clear, but the point I am getting at is you assumed the Radford project would be empty of the storage capacity before entering the low-water season, didn't you?

A. I did.

Q. And why didn't you assume the Bluestone reservoir would be emptied of its storage capacity before entering upon its low water season?

A. Because if the Bluestone reservoir had been—it would have been absurb and ridiculous to do so, the Bluestone reservoir will be designed as one of its major purposes to regulate low flows in just such periods as occurred in 1930, to a flow of not less than 2,000 cubic feet per second, that is one of the important purposes of the Bluestone project.

Q. And on the other hand you assumed that the Radford reservoir entered upon the low-water season as fixed by its rule curve, empty, was filled during the low-water season, was emptied again during the low-water season, and over half filled again during the low-water season; is that right?

A. That is not right.

Q. Is your exhibit wrong then?

A. Your question as stated is not right. I did not assume such things as you are expressing.

Q. Tell me this, have you agreed after looking at the Water Supply papers that according to the rule curve for which Radford was designed, that is 1,230 second feet, the flow at Radford did not fall and stay below 1,230 second feet until June 22, 1930?

A. Your Honor, it is presupposed I am familiar with the rule curve for the operation of the Radford project, which I have never heard of before, and in these questions Mr. Jackson insists upon my answering them in a manner that will indicate I am accepting that rule curve as a fact.

1805 By the COURT:

He is asking you to assume it is a fact. The trouble is I am afraid you are not willing to assume it as a fact, even though it is hypothetical.

Q. Mr. Johnson, assuming the rule curve for which the Radford reservoir was designed to be an average flow throughout the low water season of 1,230 cubic feet per second, you do concede from your examination of the Water Supply papers, that the flow into the Radford reservoir did not fall below that figure and stay below that figure until June 22, 1930, is that right?

A. Mr. Jackson, I can't answer that positively at this time, however evident it may appear on the surface, I cannot say, because I have not examined that sufficiently.

Q. I showed you Water Supply papers showing the average flow for June, 1930.

A. It was all an assumption, but it isn't my assumption.

Q. Didn't you testify the average daily flow according to the Water Supply papers did not fall below and stay below 1,230 cubic feet per second at Radford until June 22, 1930?

A. It did not fall and did not stay there—how far back did we examine?

Q. We examined back through June.

A. We were examining about that time. As a matter of fact I was examining from that date forward more than back of it.

Q. Well, if we have to, if your examination of this flow is so insufficient you don't know the flow back of that was higher than that, I will show you this exhibit, Water Supply paper #698, at page 62, where you have already examined June, 1930, and ask you to go back through May, April, March, February, and as far back as you want to until the preceding October, and tell me whether you find any figures there as low as 1,230 second feet?

A. No, I don't find any, none apparent to me as low as 1230.

1806 Q. As a matter of fact a great many of the flows are a good deal higher, over 2,000 and up as high as 3,200, aren't they?

A. There is just one figure in May up to 3,200, one flash.

Q. What is the day before?

A. 3,100. The average for May is 1890.

By the COURT:

The date of demarkation is what?

A. The demarkation is June 23rd and 24th.

Q. Now, Mr. Johnson, on June 23, 1930, you nevertheless show the Radford reservoir empty, don't you, on your exhibit?

A. That is right.

Q. And you show it filled during that low-water season by August 24th, don't you?

A. That is right.

Q. And then you show it emptied again during that low-water season, by September 16th, don't you?

A. That is right.

Q. And then you show it shut down entirely and only half filled again during that low-water season by October 21st?

A. Yes, sir.

Q. And that is the way you operate a reservoir on a rule curve, is it?

A. The way I operate a reservoir on a rule curve?

Q. I asked if that is the way you operate a reservoir on a rule curve?

A. That is the way one would be and the other would not.

Q. You mean this is the way not to operate a reservoir on a rule curve?

A. You may put it that way.

Q. So you assumed for comparative purposes you would show on the diagram on the one hand how to operate a reservoir on the rule curve and on the other hand you would show how not to operate a reservoir on a rule curve?

1807 A. The answer is yes, but I have to explain my answer. That doesn't——

Q. I don't see the necessity for an explanation.

A. That wasn't exactly the reason I did it, but it shows how one operated without a rule curve, and not operated under the same rule curve, and by coordinated authority may be operated in conjunction with one that is operated under a definite rule curve.

Cross-examination (continued) by Mr. JACKSON:

Q. Mr. Johnson, in your study of the plan for the Bluestone reservoir, as contained in Government Exhibit 145, House Document 91, you observed, I suppose, that the hydraulic capacity of the installation under some conditions would be as high as 11,000 second-feet, did you not?

A. I did.

Q. And even at flows as high as 4,000 second-feet, at Bluestone, the power installation would have the capacity to draw down the reservoir at the rate of 7,000 second-feet a day, or 14,000 acre-feet?

A. I may have to make some check before I can make a statement to that effect.

Q. If, as you said, the hydraulic capacity is 11,000 second-feet, you know as an engineer that if that is operated at maximum capacity, it would be able to discharge 11,000 second-feet a day, do you not?

A. Yes; 11,000 second-feet at any time it was discharging.

Q. And you know if the flow, at that time, were 4,000 second-feet, it would result in a draw-down each day equivalent to the volume of 7,000 second-foot days, don't you?

A. Yes.

Q. And that would be the same as 14,000 acre-feet, wouldn't it?

A. It would be approximately 14,000 acre-feet.

1808 By the COURT:

What is that proportion that you engineers use in calculating the volume of acre feet in terms of feet per second? I notice you arrive at the result very quickly. You must have some form of arriving at it quickly.

WITNESS. A rough approximation for cubic feet per second flowing continuously for 24 hours is 2, to put it in terms of acre feet.

The COURT. Do you mean a flow of 1,000 cubic feet per second you could figure out per acre on that?

WITNESS. Yes, sir.

Redirect examination by Mr. THOMPSON:

Q. You have shown that prior to June 23, 1930, the use of water through the Radford plant, according to your chart, Ex-

hibit 204, would have been at a rate higher than 1,230 cubic feet per second. Would the company have had any incentive to operate the Radford project in the manner you have assumed?

A. Yes, sir.

Mr. JACKSON. We object to that.

The COURT. I allow that.

Mr. JACKSON. Exception.

WITNESS. The incentive would be to conserve water and to produce electricity of the highest value. As to the matter of conserving water, I mean less water would be spilled by such operation. If the pool were operated in a manner to be able to regulate the flow below, then the capacity, the storage capacity of the reservoir, would have had to be maintained at or near its upper elevation to produce that 1,230 second feet of regulation below during the dry season. If it were so operated many times when water passes in excess of the wheel capacity, it would be spilled and wasted.

Mr. JACKSON. That is 1,980 acre-feet, I am told, for convenience.

By Mr. JACKSON:

Q. Mr. Johnson, in stating your qualifications, at record page 3651, you said from March 1930, to October 1932, "I was in the employ of Hugh L. Cooper & Company——".

A. March when?

Q. March 1930 to October 1932, "I was in the employ of Hugh L. Cooper & Company as a member of the engineering staff engaged in the design, construction and later operation of the Dnieperstroy hydro-electric project on the Dnieper River in Russia." Do you remember that statement?

A. Yes.

Q. At record 3784 and 3785 I asked you this question: "Did you ever operate a hydro-electric reservoir without releasing a substantial amount of storage for draw-down through low water season?

"A. Yes.

"Q. Where?

"A. The Dnieperstroy project, in Russia, on the Dnieper River."

Q. Do you remember giving that testimony?

A. I do.

Q. Mr. Johnson, you left Dnieperstroy June 5, 1932, did you not?

A. I don't recall whether it was June 5th. I am under the impression it was June 12th.

Q. Well, if the records of the Hugh L. Cooper Company show it, I suppose you would say it is correct?

A. I am not sure that their records are correct on that point.

Q. You say on or about June 5th or 12th, 1932, you left Dnieperstroy?

A. I believe so. I can't be certain as to that. I should have to check on that.

Q. As a matter of fact, didn't you leave for Berlin for treatment for an illness about that time?

A. At sometime in the summer of 1932, I did.

Q. And, after taking treatment in Berlin, didn't you return to this country on the "Europa" about September 7, 1932?

A. I forget the date, but it was in September, 1932. That is right.

Q. And don't you know it to be a fact that the Dnieperstroy hydro-electric project was not completed until 1933?

A. I know it to be a fact, Mr. Jackson, that the Dnieperstroy project was in operation before I left.

Q. Isn't it a fact that the only operation that ever occurred on any part of the Dnieperstroy project, before you left Dnieperstroy, was the operation of a fraction of a unit on a run-of-river basis for some part of eight or ten days before you left Dnieperstroy ill?

A. It had been operating for, I forget just the period of time; they had been operating for a much longer period than that eight or ten days. The installation was not completed.

Q. Are you willing to testify that the Dnieperstroy plant, or any part of it, was placed in commercial operation before May 8, 1932?

A. Commercial operation?

Mr. THOMPSON. Your Honor, I do not understand that they have any commercial operation in Russia, and I think counsel would know it.

Mr. JACKSON. I investigated it, and your understanding should be given him.

Mr. THOMPSON. I think everybody knows there is no such thing as commercial operation in Russia.

Mr. JACKSON. Dr. Holmes wrote a poem on that.

The COURT. What do you mean by "commercial operation?"

Mr. JACKSON. Not experimental operation. It produced current for use as against purely experimental operation.

The COURT. I presume that is what you mean, but counsel did not seem to catch it.

Mr. THOMPSON. That is right.

WITNESS. I might say the same could be applied to Wilson dam for a considerable period at the time it was starting up. But the Dnieperstroy plant, at the time it was being started up, for a considerable time, displaced a steam plant, which was operating

continuously, and there were various shops and manufacturing enterprises at the site of the Dnieperstroy plant which were using that electricity.

By Mr. JACKSON:

Q. I want you to state directly, if you know, whether or not the Dnieperstroy project commenced commercial operation, as distinguished from experimental operation, before May 28, 1932?

A. Under your definition of the distinction between experimental operations and commercial operations, that is to say the production of electricity for use rather than waste, I should say it commenced commercial operations.

Q. Do you care to testify that the Dnieperstroy hydroelectric plant commenced operations other than experimental operations or testing operations, prior to May 28, 1932?

A. To the extent it replaced the steam plant, it was useful.

Q. Wasn't it experimental operation, Mr. Johnson?

A. You can construe anything to be experimental. At Wilson dam they construed the sale of power over a long time as experimental operation when, as a matter of fact, it was delivering useful operation.

Q. When?

A. Whenever useful electricity could be marketed. As a matter of fact, they started up Wilson dam earlier, at greater expense, too, than was intended and than the program called for, for experimental or test purposes, to relieve a serious drought; and yet that was termed experimental power.

Q. I have not confused you into thinking I am asking about Wilson dam, have I?

A. I am explaining how the definition may be misunderstood.

Q. I want you to answer this question directly: Do you care to testify that the Dnieperstroy project operated other than test operations prior to May 28, 1932?

A. That is the thing that can be extended as long as you see fit. To say that a plant is undergoing tests, it can be undergoing tests, but yet it is operated, it is delivering useful electricity, which makes it all the more important.

Q. Do you care to testify the Dnieperstroy project was engaged in regular operation prior to May 28, 1932?

A. Regular operation?

Q. Yes.

A. I don't know exactly the meaning of your question.

Q. Do you testify the Dnieperstroy project was operating regularly prior to May 28 1932?

A. It was operating. I would have to actually investigate the log to recall whether it was entirely shut down very much of

the time during that period. I do know as adjustments were required to be made as is usual and to be expected in a plant during its earlier period of operation to make it conform with the specifications and the contract of those supplying various machinery, it is necessary at times to close down and make those adjustments. To that extent, Dnieperstroy may have suspended operation, and I recall an incident or two in the beginning when they did.

Q. As a matter of fact, you were ill for some time before you left, were you not?

A. I was working, though and carrying on.

Q. Not after May 23, 1932, were you?

A. I think so.

Q. In testifying that, you were measuring your words?

A. I am inclined to think so. I can't recall that exact date, but I am under the impression that I can't definitely say.

Q. Well now, isn't it also a fact——

A. I will testify, if you will pardon an interruption, that I was down day and night very much of the time that that plant was being started up and being placed into operation. I am very definite on that, and that contributed a good deal to my illness.

Q. Mr. Johnson, is it not also a fact that any operations that did occur with this plant prior to May 28, 1932, and for some time thereafter, were run-of-river operations?

A. Were run-of-river operations?

Q. Yes.

A. Yes, and the plant was essentially a non-run-of-river plant.

Q. But the operations you talk about at and before May 28, 1932, were run-of-river, were they not?

A. Yes, it may have been.

Q. And it was actually operated on run-of-river basis; is that true?

A. I am trying to recall the extent to which we may have reduced the pool elevations in the operation. I know this, that if it did, it occurred by chance and not by purpose, which would place it in the category as one of run-of-river, because a plant which is not run-of-river may at times operate with the constant pool elevation, if it just happens that there is an excess of water flowing over that required by the power plant.

Q. Let us get it clear. Do you want to testify that any of this operation occurring at or prior to May 28, 1932, was other than run-of-river?

A. Other than run-of-river?

Q. Yes.

A. That is a thing that is not susceptible of the answer that you expect me to give.

Q. I am glad you know what answer I expect you to give.

A. The plant was not a run-of-river plant. You asked me if I had operated a plant which was not a run-of-river plant.

Q. Don't be concerned about that.

A. You asked if during a certain period the plant did not draw down its reservoir.

Q. I asked you nothing of the kind, Mr. Johnson. I asked you if in operation of the Dnieperstroy plant, prior to the time you left, any operation of it was purely run-of-river operation?

A. My answer is, and I can state with definite assurance as to that, I am not sure whether we pulled the reservoir down, or not.

Q. May I again refresh your recollection on that? Don't you know it to be a fact that the gates on the main dam were not installed until June 3, 1933?

A. Isn't it possible to reduce the pool without affecting navigation?

Mr. JACKSON. I move to strike out the answer, and ask the Court to order the witness to answer the question.

The COURT. What is the date?

Mr. JACKSON. June 3, 1933.

The COURT. Do you know whether or not the gates were not installed at the plant you are speaking of until June 3, 1933?

WITNESS. Your Honor, I don't know the exact date that the gates were installed on the Dnieperstroy project.

By Mr. JACKSON:

Q. You do know the gates were not installed when you left Dnieperstroy, don't you?

A. Yes.

Q. And you do know that the pool had never been filled when you left Dnieperstroy, don't you?

A. I am not quite sure that it had not been filled.

Q. Did you keep close enough contact with this project to learn that it was not filled until after June, 1933?

A. That it was not up to discharge elevation, may I ask?

Q. That the pool was not filled?

A. Filled to where? If you have the gates, then you have the pool filled with the gates, and it will bring the pool to one elevation or level, and if the gates are not on, it will go to the crest.

Q. I presume you were at Dnieperstroy long enough to know the pool elevation which was attempted to be maintained by constructing that project?

A. Yes.

Q. I ask you whether you kept close enough contact to know whether that reservoir was not completed and filled to its normal pool level until long after June, 1933?

A. Well, that is perfectly well understood, if the gates were not installed.

Q. I should think that is so. And you have now told all of your experience about operating this reservoir at Dnieperstroy on a rule curve?

A. I have said nothing about a rule curve in connection with Dnieperstroy.

Q. Did you tell your experience about operating the Dnieperstroy project with a large draw-down?

A. The question you asked me was have you ever operated a hydro-electric plant.

Mr. THOMPSON. I protest the way that counsel asks questions as in a criminal case—inserting words that the witness has not uttered and has not suggested. It has gone on day after day.

WITNESS. I did not testify what you have said.

The COURT. I do not see anything in the cross-examination that he cannot understand.

By Mr. JACKSON:

Q. Now, just answer my question that I just asked you.

A. You asked if I have ever operated a large hydroelectric plant?

Q. Mr. Johnson, have you now told all your experience in operating the Dnieperstroy project with a large draw-down?

A. Have I told all my experience in operating the Dnieperstroy project with a large draw-down?

Q. Yes.

A. I have not.

Q. What operation did you perform of the Dnieperstroy project with a large draw-down that you have not told about?

A. It would require a very long time. Just what phase do you wish me to deal with?

Q. I want you to tell me during what periods of time, if any, you claim you operated the Dnieperstroy project, utilizing a large draw-down at any reservoir?

A. From the period of its starting.

Q. When was that, as you think?

A. In the early summer or spring, or sometime in the spring of 1932, and extending up to the time of my departure.

Q. In June 1932?

A. I forget the date.

Q. And do you want to testify during any of that period that plant was operated on a peakload basis or other than a run-of-river basis?

A. During that time was it operated other than as a run-of-river basis?

Q. Yes.

A. I am going to stick to my testimony that this plant was not a run-of-river plant, and nowhere have I found myself heretofore contradicted as to that proposition.

By Mr. JACKSON. Please read the question.

NOTE.—The question was read.

A. Yes, but how, from day to day, that plant was operated in respect to the pool height, I think it is possible while that plant was in operation, and I feel pretty sure of that, the plant was impounding water, and to that extent it was not run-of-river. If the plant is maintaining water, if it is changing its pool elevation, it cannot be called run-of-river.

Q. You think it was filling during those first operations?

A. Yes.

Q. There was no draw-down, was there?

A. I don't recall. I do not have the log before me.

Q. In any event, from your knowledge of the operations, it is not sufficiently definite to state there was any draw-down?

A. That I could say that there was any draw-down?

Q. Yes.

A. The pool did change in elevation.

Q. You understand my question.

A. To that extent it is not run-of-river. If the pool were maintained at a constant elevation we could say for a certain time it was run-of-river, but if you are discharging more water than comes in, or if you are withholding water, it is not run-of-river.

The COURT. The question is whether or not you are able to say definitely, from your recollection, that that plant was operated under conditions which necessitated at any time a draw-down in the pool elevation. That is the substance of it?

Mr. JACKSON. Yes, during this period.

A. There may have been very short intervals during the draw-down. I can't say positively as to that.

Mr. JACKSON. That is all.

1809. Of course, during such operation there would be periods when the flow was near the 1230 c. f. s., when they would not be releasing the water and would not be generating so much electricity. The electricity during relatively low flow periods is of greater value than the electricity when they have a great deal of water in all streams.

Now, as to conserving water, if they were discharging at or below the average annual flow, the reservoir would diminish when the flow fell below that flow, and if you had sufficient reservoir capacity, you could be reasonably sure of it falling if you were

discharging. It would fluctuate, rise and fall, without spilling the water. By that method of operation, the operators would be able to deliver large quantities of power at low flow season, taking advantage of the contents of the reservoir when the power is most valuable. After the electricity is generated, it cannot by any practical means be stored. It is generated and delivered that moment. So that if you are to deliver and sell, to make it possible for a plant, a hydro-plant, to sell more power than is for the moment flowing in the stream, if we speak of the stream converted into head and power, they must draw upon the storage in the reservoir. Secondary power, that is power you are required to generate and sell as the water comes along, if you choose to operate that way, would be of less value than the power which follows the demand curve.

Q. Mr. Johnson, did you ever hear of applying a rule curve on this Radford project before?

A. No, sir.

Q. Is there anything which indicates any rule curve in the application for a license by this company?

A. I have examined the application and the amended application for license to the Federal Power Commission, and I have looked and searched for the rule curve on which it is said
1810 this plant was designed to operate, in the Virginia state license, and I can find no such rule curve. I am given to understand it was designed to operate in accordance with that rule curve, and if so, I think that should have been a very important consideration in the application for the license showing how this plant would be operated.

Q. Is it possible for an engineer to estimate a thing of this kind, or determine at all, if he doesn't know, what the rule curve is; that is the basic factors that go to make up the rule curve?

A. It is impossible.

Q. So that it is impossible, is it not, for you to make any assumption?

A. Absolutely.

Q. Or to adopt any such assumption?

A. Absolutely. A rule curve does more than one thing. It has to take into account all conditions of flow, all seasons, hydrological conditions on the river. It has to go away back into the years of record.

By the COURT:

You mean all the testimony you have given is completely valueless without a knowledge of what the rule curve is about this dam?

A. Absolutely.

By the COURT:

And for that reason, because you had no knowledge of any plant operating upon a rule curve, you have gone on the assumption it was not to be operated in such manner?

A. No rule curve was in evidence.

Q. All your testimony has been based on the belief on your part that no rule curve was applicable to this Radford project?

A. Absolutely. And a rule curve will not remain a rule curve unless—we know it will not be changed, you have to have fixed factors in a rule curve.

Q. Let me read to you from the testimony you gave yesterday, page 3800:

"Q. As I understand your direct testimony, the Bluestone project is operated on a rule curve, designed to provide an average flow of 2000 second feet through extreme low water; is that 1811 right?" What is the important factor in making a rule curve there?

A. All flows of record enter in and it is designed to give a constant discharge below that dam during very low periods of flow of 2,000 cubic feet per second, and will be so operated to affect that low flow regulation, which will be a constant amount.

Q. It is a fact there you have to have a constant factor in the making of a rule of this kind?

A. Precisely so.

Q. (Reading:) "To insure a minimum discharge in New River immediately below the Bluestone dam site of not less than 2000 cubic feet per second.

"Q. And that operation is based upon a rule curve, isn't it?

"A. Yes, it would be based upon a rule curve.

"Q. And that rule curve would be predicated upon an extreme low water year, like 1930; is that right?

"A. Yes, that much of the rule curve—that determining the low flow regulation.

"Q. And under operation by a rule curve, you regulate the draw-down of your reservoir in accordance with that curve so that you will have that average amount available throughout that low water period; is that it?

"A. Exactly so.

"Q. Well now [interrupted] assuming, Mr. Johnson, that the Radford reservoir or project had been built and in operation in 1930, and you were operating the Radford reservoir on a rule curve to provide an average flow of 1230 second feet throughout the extreme low water season, and assuming, as shown by your examination of the water supply papers, that the flow into Radford reservoir did not fall and stay below 1230 second feet until

the 22nd of June, 1930, what would have been the condition of your reservoir on June 23, 1930?"

Q. Is there any difference in attempting to set up the rule curve based upon average flow and one where there is a constant factor?

A. There is all the difference in the world.

1812 Q. Is it possible when they present to you a question of an average flow as a basis for an assumption to give any answer on it definitely?

A. It is not possible.

Recross examination by Mr. JACKSON:

X Q. Mr. Johnson, you testified on your re-direct that electric energy is most valuable during the low flow period; is that right?

1813 A. Yes, sir.

X Q. Don't you think in view of that principle it would require a positively financial genius to adopt a plan which would result in entirely depriving a company of the production of any energy from August 24th to September 16th, 1930, and from September 16th, 1930, to some indefinite time, after October 21, 1930, as you show on your Exhibit #204?

A. No, sir; not under the circumstances. Under the normal operations the reservoir after being drawn-down to what it was at the date of June 23rd would have been replenished. There had been some low flow before that time, and having done so, that electricity would have been marketed at what was then a low flow period.

X Q. Have you finished your answer?

A. And after that time it would have been necessary in any event to have made use of the reserved capacity elsewhere because the flow diminished to such point.

X Q. In your opinion you would have been better off without any hydro peaking capacity from June 23rd and September 16th on, is that right?

A. I have not said that it would have been better if there could have been hydro peaking capacity of sufficient capacity to have prevented the starting up of steam installations.

X Q. Do you know how much swing the steam installations of the Appalachian Electric Power Company system will take?

A. In their aggregate?

X Q. Yes.

A. No; I don't.

X Q. You haven't the slightest idea, have you?

A. No; I don't know.

X Q. You don't know any more about that than you do

1814 about the rule curve for the Radford project?

A. I have never seen the rule curve.

XQ. Coming back to your Exhibit #204, Mr. Johnson. You examined the Water Supply papers at my request yesterday showing the flows in April and May and early part of June 1930, didn't you?

A. Yes, sir.

XQ. And there was no part of that time when the hydraulic capacity of the Radford installation did not very substantially exceed the average flow, was there?

A. Yes; it exceeded the flows shown.

XQ. You remember most of them were on the order of 2,000 second-feet?

A. I believe if I recall correctly—yes, I will agree to that, although I believe it is in the record you were pointing out for very long times there was 5,600 there.

XQ. Didn't you object strenuously when I pointed out for instance 3,200 and 3,100 and another of 5,600 or 5,900 second-feet, and you explained that was only for a day or two?

A. It was just a flash in that particular month.

XQ. Now to be perfectly frank and honest, you know those Water Supply papers show throughout that period the flow was very substantially less than the hydraulic capacity of the Radford installation, don't you?

A. I do.

XQ. Now, Mr. Johnson, if prior to entering the low flow period on June 23, 1930, as shown on your Exhibit #204, you had not drawn-down the Radford reservoir, as you did, would that flow have been utilized at a higher head?

A. If it had not been drawn down would it have been utilized at a higher head?

XQ. Yes.

1815. A. The stream flow was a small and diminishing stream flow, and it would have been utilized assuming no draw down even prior to that date. Assuming you had a full reservoir it would have been utilized at a higher head but without generating as much power, without producing as much power at the time when the power is more valuable, a time when there is great demand for that power, as you could have secured if you had drawn down the reservoir.

XQ. Is power more valuable in April and May than in August and September?

A. It is more valuable in April and May, if the flows are very low, and there is a reduced flow; therefore, plants are compelled to reduce outputs and reserve steam capacity has to be made use of.

XQ. Weren't the flows low in early August and late September of 1930, lower than they were in April and May?

A. While that is true, it could not have been anticipated by those operating it that this was a record year before it had occurred.

XQ. Let me understand you. You have gotten up an exhibit showing you operated Bluestone as of 1930, upon the basis of information derived after the experience of the 1930 condition, and undertake to operate Radford, denying it the benefit of the knowledge of the experience derived during 1930, haven't you?

A. Yes, and let me explain that. The Bluestone if operated in a different manner could show greater financial returns than it does. It sacrifices financial returns for stream regulations.

XQ. Coming back to this Mr. Johnson, don't you know that the Radford project under 1930 conditions could have been operated in April and May by simply using the then flow of the river?

A. The small flow.

XQ. Whatever it was, it is very much in excess of 1,230 second feet, without wasting any water, and without lowering the reservoir?

A. That is true, but the incentive to discharge a larger
1816 amount of water than was flowing into the reservoir is apparent, because it was a period of low flow, when there is demand for electricity.

XQ. You said one reason, on your direct, for your drawing down the Radford reservoir during April and May and early June of 1930 was to avoid waste of water. Now the fact is, the hydraulic capacity of that reservoir would have utilized all the water that flowed during those months, wouldn't it?

A. It was done to prevent waste in water, the idea being this, that if you discharge something on the order of 3,000 cubic feet per second, assuming that is just under the mean annual flow, very little water will be wasted, the reservoir will be full at times and drop down at other times, and it will not vary within very wide limitations throughout a normal year, or any year excepting a very abnormal year, up and down.

XQ. Your theory of the operation of a reservoir is you operate it at a constant rate equivalent to what has been determined for the average flow of the stream for a year?

A. No, the rule curve would stay with that as a basis, and based upon experience——

XQ. Did you ever hear of such rule curve? Such rule curve as that for the operation of a reservoir, based upon a straight line operation, as equivalent to the average flow of the river?

A. It wouldn't be exactly that.

XQ. A rule curve would never be based upon the average flow of the river, would it?

A. It might easily be. If there were large enough capacity so you could be sure of utilizing all the water flowing into a stream and you could market your electricity, that is exactly what you would do. Your discharge would equal the flow of the river and you would not lose any water.

1817 By the COURT:

To that extent your rule curve is based partly at least on the flow of the stream?

A. Your Honor, that would depend upon the way—the relationship that existed between the reservoir capacity, the flow of the stream, the hydraulic capacity and the system demands. The one important element in the consideration of any plan of operation, and that of a rule curve, if a rule curve is determined, is the average annual flow of the river, if you could impound all that would be the exact amount you would discharge, to conserve and use all water.

XQ. But all you are saying now is if you could impound the entire flow of the stream, floods and all, you would have such a quantity of unsable storage you could maintain an average flow, isn't that so?

A. If you could store and impound all, yes.

XQ. It still remains true when you cannot store and impound all, and we are not talking about any such condition, are we——

A. You approach that condition within very narrow limits. It is possible.

XQ. We are trying to talk about these projects and not what is possible. Do you contend the Radford project or Bluestone project is so constructed it can impound the entire flow of the stream, floods and at all times?

A. I believe the wastage on the Bluestone is perhaps on the order of 4%.

XQ. You mean the Bluestone impounds within 4% of the total annual run-off?

A. That is according to their method of operation. If I am correct, and I won't be positive on that matter, but roughly 4% is discharged according to my best recollection, or wasted. It may be 5%, or a little larger, but I think not over 5%

1818 would be wasted by the Radford project.

XQ. Will you tell me what the average flow of New River is at the Bluestone dam site?

A. It is given as 6,440.

XQ. Will you tell me why they supply regulated flow of 2,000 second-feet if the Bluestone project has impounded the entire flow of the stream with an average annual flow of 6,400 second-feet annually?

A. Because the Bluestone discharges flows far in excess of the average annual necessary to maintain the reservoir down to below thirty feet of the upper limits of that reservoir, and it passes the water as it flows into the reservoir up to wheel capacity when it tends to rise above its elevation it is seeking to maintain. It does that as a sacrifice of marketing its electricity at the most advantageous season.

X Q. If you did impound the flood flows and had more storage capacity you could increase your regulated flow below the Bluestone impounded flow?

A. May I have reference to the 308 report?

X Q. Let me ask you another question, which may make clearer what I have in mind. If they utilize the thirty feet of flood storage, then they could increase the regulated flow below Bluestone, could they not?

A. Oh, yes, that is freely admitted by anyone.

X Q. But they have not done it, have they?

A. No, because one of its major purposes is to maintain flood control to provide capacity for flood control, that must be kept empty, and not encroached upon.

X Q. Whatever the reason, when we are talking about utilizable storage at either Radford or Bluestone, we are not talking about storage capable of storing the entire annual run-off of New River, so as to equalize the flow throughout the year, are we?

1819 A. You don't have to store the entire flow of the river to equalize the flow throughout the year.

X Q. We are not dealing with reservoirs that store enough of the high flow of New River to equalize the flow throughout the year, are we?

A. We are dealing with reservoirs that can store a very substantial amount or portions of the peaks. Bear in mind the reservoirs we are dealing with can vary their flows, as they enter the reservoirs, and there remains but a portion of the flow higher than that which they must store.

By Mr. JACKSON:

Q. Now, Mr. Johnson, isn't it a fact that the 2,000, or approximately 2,000 regulated flow at the Bluestone is derived by adding the extreme low water flow at the Bluestone dam site to the utilizable storage of the Bluestone reservoir?

A. That capacity regulated to the dryest year, that is right.

Q. The rule curve for operating a reservoir during low water season is not an arbitrary thing, but one that is based upon the study of all available low water data on the stream.

A. For low water, did you say?

Q. Yes, sir.

A. That regulating the low water is not an arbitrary thing?

Q. It is not an assumed thing? It is something that is based upon a study of all available data on the low water flows on that stream?

A. It is, and it is based on knowledge of all natural artificial conditions.

Q. And don't you know that the power commission made such a study at Radford?

1820 A. I don't know that—of Radford, you say?

Q. Yes.

A. I do not—please let me have the question again.

Q. Read the question.

(It is not an assumed thing, it is something that is based upon a study of all available data on the low water flows on that stream?)

A. My answer as to what extent the Federal Power Commission may or may not have, is something that I don't know. I never was employed by the Federal Power Commission and I am not sufficiently well acquainted with what they have done to be able to answer that quetsion.

1835 JOHN A. DAVENPORT

Direct examination by Mr. JONES:

Q. Your name is John A. Davenport, and you reside in Cincinnati, Ohio?

A. Yes.

Q. What is your present employment, Mr. Davenport?

A. I am engineer with the Corps of Engineers, Division Office.

Q. United States Engineers?

A. Yes.

Q. Please state your training by way education and experience in the position you now occupy and the duties which you discharge.

A. I am a graduate in engineering, with the degree of B. S., from the University of Kansas. I also hold the professional degree of Civil Engineer from the same institution.

Among my experiences, I have been employed by the Department of Agriculture and in stream flow study by the United States Geological Survey. I have been Assistant State Engineer for the State of North Dakota. I have been on various works in the State of Illinois, about half of which was in the location, design and construction of bridges. I have done work involving hydraulic studies in the States of Utah, Nevada, Montana and Texas. I have been a special instructor in hydraulics at the Uni-

versity of Utah. I was Engineer Advisor to the Government of New Mexico in the Colorado River Commission affair. I have had valuation work, miscellaneous private employment.

What else did you ask, Mr. Jones?

Q. Have you had any experience—I believe you have already stated that—in considering hydraulic problems with reference to construction?

1836. A. About half of my work has involved hydraulic problems of one kind or another.

Q. Please state your present connection with the United States Engineers, how long that has been, and what duties generally you have been discharging since you have been with the Engineers.

A. I have been with the Engineers this time since about the first of May, 1931, first in the upper Mississippi valley division office, and then, when the Ohio River division office was formed, I was transferred to that office, and I am there at present, and among my other duties I take care of Federal Power Commission work, which is assigned by orders and regulations to the Division Engineer of the Ohio River Division.

I was previously employed by the Corps of Engineers on the Missouri River, in Kansas, and Nebraska, South Dakota and North Dakota, in the years 1912 and 1913—at that time under Colonel Herbert Deakyne.

Q. The Cincinnati office is the division office?

A. Yes.

Q. Is that office at Charleston?

A. No; that office is at Cincinnati, Ohio, and the division office is over the district office at Huntington.

Q. Your Cincinnati office, as I understand, embraces this field and the Ohio River?

A. All the Ohio River that is assigned to the Corps of Engineers.

Q. Have you made an investigation of low flows in the Ohio River in that section just above the confluence of the Kanawha with the Ohio, and, if so, at whose direction did you make such a study?

A. I have made those studies, or had them made under my direction, and that was a part of my regular duties in my assignment in Ohio River Division Office. The instructions came from the Chief of Engineers to the Division Engineer in charge of the office.

1837. Q. Do you know who Mr. G. H. Pierce is?

A. C. H. Pierce?

Q. C. H. Pierce.

A. Yes, sir.

Q. Is he from your office?

A. No, sir; he is from the U. S. Geological Survey.

Q. From the studies that you have made of this flow, are you prepared to testify in that connection at this time?

A. Yes.

Q. Are you familiar with Exhibits Nos. 110 and 111, introduced by the Government in this case?

A. I am.

Q. You have examined them with particularity?

A. I have used the information that they contained to assist me in the preparation of the figures I propose to submit here.

Q. In your calculations on stream flow I have indicated, you have used basic data 110 and 111; is that what I am to understand?

A. That is a part of the basic data.

Q. What other data have you used or employed in the preparation of your conclusions on this stream flow?

A. I used certain of the Ohio River charts, which are a compilation by the Corps of Engineers of the Ohio River, showing certain features, outlinging the stream, and the depth of water, and elevations, and so on.

Q. What part of the Ohio River do the charts cover to which your study was particularly directed?

A. My study was particularly directed to what was known as pool 25 in the Ohio River, and these charts to which I refer cover that area.

Q. Where is pool No. 25, Mr. Davenport, with reference to Point Pleasant, or the mouth of the Kanawha?

A. Pool 25 is the part of the river extending from dam
1838 No. 25 to dam No. 24. Dam 25 is about five miles above the confluence of the Ohio and the Kanawha, and the pool is about 18 miles in length.

Q. The record of surveys made by the Engineers are public records and are made in the course of investigations on the part of the Engineers; is that correct?

A. Yes. They are public records available to anybody upon application to the District Engineer at Louisville, Kentucky—the U. S. District Engineer—upon payment of twenty-five cents per copy. They represent the data collected by the Engineers over a period of several years and were published in 1915 by Government authority.

Q. Are Exhibits 110 and 111 copies of these charts?

A. No; Exhibits 110 and 111 are the official records of the gauge heights at dams 24 and 25. They cover the periods to which I intend to offer the figures of flow.

Q. These records from which your compilation is made, which you state are official copies, have you any certified copies of these records to accompany your testimony?

A. Yes; I have certified copies of the Ohio River charts.

Q. Where are they?

A. They are at your elbow. Those have been certified to by the Chief of Engineers and Secretary of War, as being official copies, taken out of the records of the War Department at Washington.

Q. Have you reference to Chart No. 67, Ohio River, Pittsburgh, Pennsylvania, to mouth, and charts of a similar nature numbered 68, 69, 70, 71, and 72?

A. Yes.

By Mr. JONES:

Q. These, I understand, Mr. Davenport, are the charts and records to which you have referred in answer to the
1839 questions just propounded?

A. Those are the basic data upon which my determinations are based.

(Exhibits 221, 221-A, 221-B, 221-C, 221-D and 221-E, being Ohio River Charts 67 to 72 respectively, were offered in evidence.)

By Mr. JONES:

Q. I believe you stated you used gauge records: Where did you say you obtained the gauge records—that is, the flow of the stream?

A. These are the official records of the lock gauge readings. They are taken from the Huntington office. They were brought here as Exhibits 110 and 111.

Q. Are you of the opinion that they are the best records available to you for your determinations?

A. These are the best records available for me. I consider them to be very accurate. They were taken in the course of their regular employment by regular employees of the War Department engaged upon lock operations. They were subject to check—not check, but subject to observation by the navigators on the river, and, being more or less public and subject to check at the time, they apparently contain very few errors.

Mr. JACKSON. I move to strike out that statement. The witness cannot testify as the exhibits were prepared in 1918, and the witness indicated that he did not know about them then.

By Mr. JONES:

Q. Using these charts and lock gauge records, as I understand, you have made computations showing the flow of pool 25, Ohio River, during certain low flow periods?

A. I have done that, or had it done under my supervision.

Q. Supervision and direction?

1840 A. Yes.

Q. What, Mr. Davenport, was the average flow of Ohio River in the part you have referred to where your computations were made for the ten-day period from July 10 to July 19th, inclusive, in 1918?

Mr. JACKSON. May it be understood that all testimony with reference to the flow of the Ohio River is subject to our objection as incompetent, irrelevant and as not bearing upon the issues in this case?

The COURT. Yes.

Mr. JACKSON. And exception noted.

Mr. JONES. As I understand, the Court has heretofore ruled that that evidence is admissible?

The COURT. Yes.

A. The average flow in pool 25, as calculated, was 2,700 cubic feet per second.

By Mr. JONES:

Q. Adding this flow to the flow stated by Mr. Pierce in evidence in this case, would that show the combined flow of the Ohio River below the confluence of the Kanawha?

A. Yes.

Q. What was the combined average flow of the two streams, Mr. Davenport?

A. The computed combined average flow of the two streams was 7,735 cubic feet per second, which means that the Kanawha's part was 65 percent of the total, or, in other words, the Kanawha's flow was as great as the flow in pool 25 in the Ohio River and six-sevenths times besides for the Kanawha's flow was 1.86 times as great as the flow of the Ohio in pool 25.

Mr. JACKSON. We move to strike out the part of the answer giving the ratios, as not responsive.

The COURT. The motion is denied.

Mr. JACKSON. Exception.

By Mr. JONES:

Q. Now, Mr. Davenport, using the same data and the comparisons, taking into account the exhibits which you have referred to, will you give us the figures on the nine-day period from July 23 to 31st, 1918?

A. Inclusive?

Q. Yes.

A. The same form of answer that I made before?

Q. Just in your own way, whatever the answer may be.

A. The calculated average flow in pool 25 in the Ohio River for that period was 1,680 cubic feet per second; the combined average flow was 9,045, of which the Kanawha contributed 81

percent or four and three-eighths times as great as in pool 25.

1841 By the COURT:

Q. Where were these readings taken from which you took of combined flows below the confluence?

A. I furnished the flow of 1,680 cubic feet per second. Mr. Pierce testified to the flow of 7,365 cubic feet per second at the mouth of the Kanawha. Adding those together, I get the flow in the main stem below the confluence—that is, adding the flow as it comes out of the Kanawha.

Q. Are there gauges below the confluence?

A. There are gauges at each of the locks below.

WITNESS. I am using the figures Mr. Pierce gave.

By Mr. JONES:

Q. You are making the computation of the flow below the mouth of the Kanawha, and you state that there is a Government dam below the mouth of the Kanawha; what is the distance of the Government dam you refer to below the mouth of the Kanawha?

A. Somewhere around 10 or 11 miles. I do not recall that figure. I have submitted information which caused me to give you the correct figure, but I do not have it here now.

Q. You are using figures which Mr. Pierce has submitted in evidence; do you know how he arrived at those figures?

A. I heard him give the figures.

Q. How did he arrive at them?

By Mr. JONES:

Q. What was his method of arriving at the figures which he testified to, if you know, Mr. Davenport?

A. I am not guaranteeing the accuracy of those statements. As I listened to Mr. Pierce, I gathered he took the gauge readings at Kanawha Falls, in which they had rating curves, and by using that and interpolations as to drainage area and proper run-off, with the assistance of any gauging stations in the drainage

1842 area below Kanawha Falls, arrived at what would be the correct discharge at the mouth of the river. That is a brief statement. These are based on the best sources of the U. S. Geological Survey, in making these determinations.

Q. Do you know of any better method of arriving at the discharge of the Kanawha than has been utilized by Mr. Pierce in his testimony?

A. The best method would be to dip it out in buckets and measure each one, but that method was not available. As far as I know that was the best method available at that time.

Q. We may understand your computations are based upon the conclusions reached by Mr. Pierce of the Geological Survey, together with the data which you have obtained from the Engineer's office, for these computations?

A. For the flow in the stream below the confluence of the Ohio and Kanawha

Q. I had asked you about the ten day period from July 10 to 19, inclusive, 1918. I think you said that was 2,700 cubic feet per second. Is that right?

A. Yes, sir.

Q. Had you proceeded to make computations as to the combined flow, if not, I wish you would do so?

A. I covered that period July 10th to 19th, 1918. I believe also from July 23rd to July 31st, 1918. All of these dates are inclusive figures, the same as Mr. Pierce showed.

Q. Will you give us the same data for the eight-day period, August 24 to August 31, 1918?

A. The calculated average flow in pool 25 of the Ohio for that period was 1,210 second-feet.

The computed combined average flow was 5,945 second-feet, of which the Kanawha contributed 79%, or 3.9 times as great as the flow in pool 25 of the Ohio. Practically the same conditions I have noted for the previous period.

By the COURT. Did I understand you to say according to your understanding, Mr. Pierce's figures of the discharge at the mouth of the Kanawha were based on gauge readings at Kanawha Falls? 1843

A. In that neighborhood; yes, sir.

By the COURT. And then computed on a proportionate drainage area?

A. Partially and partly on other gauges they had in the remaining area, from that on downstream, in the remaining drainage area, and their experience as to run-off in low water periods in those areas.

By Mr. JACKSON. You don't mean any gaging stations on the Kanawha itself.

By the WITNESS. The other tributaries, like the Elk River and others.

By Mr. JACKSON. And very few of those?

By the WITNESS. I have been over it in connection with applications for license with Col. Scheidenhelm, but I am not competent at this time to testify as to the exact stations or readings. Did I answer your question, your Honor, to your satisfaction?

By the COURT:

The thought that was running through my mind was after what you had stated, that the discharge at the mouth of the

Kanawha was computed on a proportionate drainage area of readings at Kanawha Falls, there has been evidence in this case by the Government the larger part of the precipitation, the biggest part of the run-off, comes from above Kanawha Falls and in fact above Radford.

A. Yes, sir; that is why I stated they used a proportional run-off for these minor gauging stations in the remaining area. I have forgotten what the area at Kanawha Falls is, 8,000 or 8,300 square miles, and the area at the mouth is 12,200.

He did not take a direct proportion of drainage areas, as I understand, but used these proportions as indicated by the run-off, in the remainder of that drainage area, to arrive at their total figure, because as you stated the ratio for the run-off per square mile is much greater in the Radford area than it is farther
1844 down-stream, and that apparently decreases, the run-off per square mile decreases, as it comes down toward the mouth, and in other studies involving Federal Power applications for this same company, or its affiliated companies, we have noted somewhat the same thing, that below Kanawha Falls it is very small.

Q. For the purpose of the comparisons you have made, whether Mr. Pierce be correct or not, you have utilized his figures in conjunction with the figures you have obtained?

A. Yes, sir.

Q. Will you give us the same comparison for the eight-day period August 24 to August 31, 1918, or have you given that?

A. I gave that one.

Q. Now take the same data for the eight-day period September 21 to September 28, 1920.

A. The calculated average flow in pool 25 Ohio River, was 2,360 second-feet; the computed combined average flow was 6,310 second-feet, of which the Kanawha contributed 62%.

Q. Now if you please the same information or data from October 8th to October 12th, 1920.

A. The calculated average flow in pool 25, Ohio River, was 3,925 second-feet. The computed combined average flow was 7,960 second-feet, of which the Kanawha contributed over 50%. May I add here the next period covered by Mr. Pierce I have inadvertently omitted from my notes, and if the Court will permit, I will furnish that data.

By Mr. JACKSON:

Q. Would you mind stating the Pierce figure so I will have it?

A. 4,035.

Q. Supply the same data for the three day period September 19 to September 21, 1923.

A. The calculated average flow in pool 25, Ohio River, was 3,065 second-feet. The computed combined average flow was 5,425 second-feet, of which the Kanawha contributed over 44%.

By Mr. JACKSON:

Q. The Pierce figure was that?

A. 2,365.

Q. Supply the same data for the three-day period September 30 to October 2, 1923.

1845 A. The calculated average flow in pool 25, Ohio River, was 2,125 second-feet. The computed combined average flow was 5,815 second-feet, of which the Kanawha contributed over 64%.

Q. Mr. Pierce's figure was 3,690, was it not?

A. Yes, sir.

Q. Now the same data for the four-day period, October 8th to 11th, 1923.

A. The calculated average flow in pool 25, Ohio River, was 1,330 second-feet. The computed combined average flow was 3,225 second-feet, of which Kanawha contributed over 58%.

Q. And the Pierce figure was what?

A. 1,895.

Q. And the same data for the period October 14th to 25th, 1923.

A. The calculated average flow in pool 25, Ohio River, was 2,420 second-feet. The computed combined average flow was 4,075 second-feet, of which the Kanawha contributed over 40%.

Q. What is Mr. Pierce's figure on that?

A. 1,655.

Q. Now the same data for the six-day period August 24 to 29, 1925.

A. The calculated average flow in pool 25, Ohio River, was 3,105 second-feet. The computed combined average flow was 4,535 second-feet, of which the Kanawha contributed over 31%.

Q. And Mr. Pierce's figure?

A. 1,430 second-feet.

Q. In all instances the subtraction will afford the Pierce figure?

A. Subtraction will in this case. I got mine by addition.

1846 Q. Now as to the seven-day period, September 4 to 10, 1925.

A. The calculated average flow in pool 25, Ohio River, was 1,510 second-feet. The computed combined flow was 2,775 second-feet, of which the Kanawha contributed over 46%. The Pierce figure in this case was 1,265 second-feet.

Q. When you use the words "calculated average flow" you mean taking the readings of which you have spoken, and averaging the figures?

A. Calculated means the flows which we arrived at from the data we had available, and average means over that period, whatever number of days it was.

Q. Now the same data for the four-day period September 13, 1925, to September 16, 1925.

A. The calculated average flow in pool 25, Ohio River, was 1,955 second-feet. The computed combined average flow was 3,125 second-feet, of which the Kanawha contributed over 38%. The Pierce figure for the same was 1,170 second-feet.

Q. And for the eight-day period August 16 to 23, 1929.

A. The calculated average flow in pool 25, Ohio River, was 4,575 second-feet. The computed combined average flow was 8,325 second-feet, of which the Kanawha contributed over 45%. The U. S. Geological figure for the same period was 3,750 second-feet.

Q. You mean the Pierce figure when you say the U. S. Geological figure?

A. Yes.

Q. Supply the same data for the twenty-seven day period August 26 to September 11, 1929.

A. The calculated average flow in pool 25, Ohio River, was 3,660 second-feet. The computed combined average flow was 7,680 second-feet of which the Kanawha contributed over 52%, and
1847 the Pierce figure for Kanawha River flow 4,020 second-feet.

Q. Give the same data for the seven-day period September 24 to September 30, 1925.

A. The calculated average flow in pool 25, Ohio River, was 4,355 second-feet. The computed combined average flow was 7,175 second-feet, of which the Kanawha contributed over 39%. The figures testified to by Mr. Pierce was 2,820 second-feet.

Q. And the same data as to the month of August, 1930.

A. The calculated average flow in pool 25, Ohio River, was 2,050 second-feet. The computed combined average flow was 3,630 second feet, of which the Kanawha contributed over 43%, and Mr. Pierce's figure was 1,580 second-feet.

Q. Take the month of September 1930.

A. The calculated average flow in pool 25, Ohio River, was 2,690 second-feet. The computed combined average flow was 4,020 second-feet, of which the Kanawha contributed over 33% and the Pierce figure was 1,330 second-feet.

Q. And as to the month of October 1930?

A. The calculated average flow in pool 25, Ohio River, was 2,755 second-feet. The computed combined average flow was 3,905 second-feet, of which the Kanawha contributed over 29%. Mr. Pierce's figure was 1,150 second-feet.

Q. Now as to November?

A. For the twenty-seven day period November 1 to 27, 1930, inclusive, the calculated average flow in pool 25, Ohio River, was 3,130 second-feet. The computed combined average flow was 4,915 second-feet, of which the Kanawha contributed over 36%, and Mr. Pierce's figure was 1,785 second-feet.

Q. Take the 119-day period, from August 1, 1930, to November 27, 1930.

A. Summing up these figures, the calculated average flow in pool 25, Ohio River, was 2,640 second-feet. The computed combined average flow was 4,090 second-feet, of which the Kanawha contributed over 35%, and Mr. Pierce's figures for the same period are 1,450 second-feet.

1848

Q. As to the nineteen-day period, October 25 to November 13, 1931?

A. The calculated average flow on pool 25, Ohio River, was 4,560 second-feet. The computed combined average flow was 7,005 second-feet of which the Kanawha contributed over 35%, and Mr. Pierce's figures for the same period were 2,445 second-feet.

Q. And the nine-day period, August [illegible] to 17, 1932?

A. The calculated average flow in pool 25, Ohio River, was 2,985 second-feet. The computed combined average flow was 6,920 second-feet, of which the Kanawha contributed over 56% and Mr. Pierce's figure was 3,935 second-feet.

Q. And the thirty-seven day period, August 25 to September 30, 1932?

A. The calculated average flow in pool 25, Ohio River, was 2,540 second-feet. The computed combined average flow was 4,120 second-feet, of which the Kanawha contributed over 38%. Mr. Pierce's figure was 1,580 second-feet.

Q. And the same data for the twelve-day period October 10 to 21, 1933.

A. The calculated average flow in pool 25, Ohio River, 3,490 second-feet. The computed combined average flow 5,250 second-feet, of which the Kanawha contributed over 33%. Mr. Pierce's figure was 1,760 second-feet.

Q. Take the period totaling 321 days.

A. This summation of all the flows given for the 321 days shows Ohio River 2,805 second-feet; Kanawha River 2,380 second-feet, total 5,185 second-feet. The Kanawha furnished 45.9%, or the flow of the Kanawha was ⅞ as large as the flow of the Ohio in pool 25.

Q. That is a summation of the 321 days you have just given or covered?

A. Yes, sir.

Q. Now will you supply the same data for the four-day period August 1 to August 4, 1930?

1849 A. Might I add the flow which Mr. McWhorter mentioned in his testimony for the ten-day period September 15 to 24, 1932, in which the calculated flow, average flow, in pool 25 Ohio River, was 1,770 second-feet.

Q. Have you answered as to the period August 1 to 4, 1930?

A. No, sir; the calculated average flow in pool 25, Ohio River, was 1,550 second-feet. The computed combined average flow was 2,935 second-feet, of which the Kanawha contributed over 47%, and the flow in the Kanawha at the same time was 1,385 second-feet.

Q. Assuming that the Radford dam had been erected and the flow at that site which formed a part of the 2,935 second-feet, the water was withheld at Radford, what would be the average flow for the four-day period?

A. 2,113 second-feet, a reduction of over one-fourth.

By Mr. JACKSON. I object to the question. There is nothing to show the witness knows anything about the flow at Radford.

By Mr. JONES. That is what I am trying to find out.

By Mr. JACKSON. He has already answered your question.

Q. Mr. Davenport, the question was, having made the calculation there was a combined flow of 2,935 feet below the mouth of the Kanawha River, and that the Radford dam had been built, that retention of water at the Radford dam, the water was withheld at Radford, what would be the dimunition of the flow in the Ohio River, if any?

A. I answered that the flow would be reduced over one-fourth, to 2,113 feet. The basis of that answer is that Mr. Pierce testified the flow at the Radford dam site for the equivalent period was 822 second-feet.

By Mr. JACKSON:

Q. You simply subtracted Mr. Pierce's figure from your total?

A. Exactly.

Q. You used in reaching that conclusion just as you had with respect to your other testimony, the figures testified to by Mr. Pierce?

A. Yes, sir.

Q. For the eight day period August 13 to 20, 1930, 1850 what was the average flow in pool 25, of the Ohio River, the combined flow in the Ohio River below the junction of the Kanawha, and what would have been the combined flow without the Radford portion?

A. The calculated average flow in pool 25, Ohio River, was 1,470 second-feet. The computed combined average flow in the Ohio River below its junction with the Kanawha was 2,840 second-feet, which would have been only 2,030 second-feet had

the Radford portion been withheld, or a reduction of 28% in the combined flow.

By the COURT:

The figures you are quoting are figures you have compiled from the records and gauging stations on the Ohio River?

A. The flows in pool 25.

By the COURT:

You have certain figures which Mr. Pierce testified to, for the accuracy of which you do not vouch?

A. I do not.

By the COURT:

Then from the figures you have and the figures he gave you make certain calculations?

A. Yes, sir.

By the COURT:

Which the Court could make, but you save the Court the trouble. I don't see any objection to that.

Q. Now having in mind the same figures, or rather the same method, what is your data for the seven-day period, September 15 to 21, 1930?

A. The calculated average flow pool 25, Ohio River, was 1,570 second-feet. The computed combined average flow in the Ohio River below its confluence with the Kanawha River was 3,000 second-feet, which would have been only 2,173 second-feet had the Radford portion been withheld, or a reduction of over one-fourth.

By Mr. JACKSON:

Q. In those answers as you did before, will you
1851 give the Pierce figures you deducted?

A. 827 second-feet was the figure I deducted.

By Mr. JACKSON:

Q. For Radford?

A. Yes, sir.

By Mr. JACKSON:

Q. What about the one before?

A. 810.

Q. Those were the Pierce figures for the flow at the Radford dam?

A. Yes, sir.

Q. Now the data for the ten-day period September 26 to October 5, 1930?

A. The calculated average flow in pool 25, Ohio River, was 1,570 second-feet. The computed combined average flow was 2,859 second-feet, which would have been reduced to 1,951 second-feet had the Radford portion been withheld, or a reduction of over 30%. The Pierce figures for the Radford dam site at that time was 908 second-feet.

By Mr. JACKSON:

Q. The Pierce figure was what?

A. The mouth of the Kanawha 1,290.

Q. Now the figure for the ten-day period September 13 to 22, 1932.

A. The calculated average flow in pool 25, Ohio River, was 1,451 second-feet. The computed combined average flow in the Ohio River below its junction with the Kanawha River was 2,705 second-feet, which would have been only 1,935 second-feet had the Radford Portion been withheld, or a reduction of over 28%. Mr. Pierce's figures for the same time, Radford 766, mouth of the Kanawha river 1,250 second-feet.

Q. One other calculation for the period September 4, to September 8, 1925?

A. The calculated average flow in pool 25, Ohio River, was 1,195 second-feet. The computed combined average flow in the Ohio River below its junction with the Kanawha was 2,475 second-feet, which would have been reduced to 1891 second feet had the Radford portion been withheld, a reduction
1852 of 23%. Mr. Pierce's figures for the same time was 584 second-feet at Radford; 1,280 second-feet at the mouth of the Kanawha.

Q. Mr. Davenport, you have stated that among your other duties you had done some work for the Federal Power Commission.

A. I do work in connection with the Federal Power Commission, assigned to the Ohio River Division.

Q. Have you in that work come in contact with the officers or representatives of the Appalachian Electric Power Company on occasions?

A. Yes, sir; or their affiliated or subsidiary companies.

Q. What affiliated and subsidiary companies operate the London and Marmet dams?

A. My recollection is they are operated by the Appalachian Electric Power Company, although the license runs to the Kanawha Valley Power Company and other subsidiaries.

Q. Who is interested in the Winfield dam operation, or has that been completed?

A. No, sir; it has just been started.

Q. What company do you know will have the operation of it?

A. The license is to the Kanawha Valley Power Company. It was natural to suppose the same people would operate it as operate the Marmet and London.

Q. Who did you say operated the Marmet and London dams?

A. As I recall the Appalachian Electric Power Company.

Q. Did you ever have, within recent years, in fact in May, 1936 of this year, a conference or consultation or conversation, with the consulting engineer, Col. Shceidenhelm, in connection with the proposed operation of the Winfield power plant?

1853 A. I have; yes, sir.

Q. Where did the conversation take place?

A. Practically at the site where the Kanawha Valley Power Company is starting to construct the Winfield power house.

Q. And that was when?

A. In May 1936, this year.

Q. Did you interrogate Col. Scheidenhelm as to the proposed operation by the Appalachian Electric Power Company of the Kanawha hydro plants?

A. Yes, sir.

By the COURT. Has the license already been granted to that company to operate these two plants?

A. All three plants.

By Mr. JONES:

Q. Mr. Davenport, this was in May 1936, just two months or more ago, if I understand you, when Col. Scheidenhelm was at the Winfield dam with you?

A. A little over two months; yes, sir.

Q. What connection at that time, or what duties were you discharging in connection with the Winfield dam and what was the occasion of your visit there?

A. I was there as a representative of the Division Engineer. Col. Scheidenhelm was there to meet a representative of the company contractors, constructing the Winfield dam, and they were to effect some negotiations concerning a modification of construction of dam to fit into the plans of the Power House.

By Mr. JACKSON:

Q. You mean at Winfield?

A. Yes, sir.

By Mr. JONES:

Q. What were you doing at Winfield dam?

1854 A. It was a part of my duty to go up to the Winfield dam, and as it happened, this was the time when Col. Scheidenhelm was there to negotiate for his company for some arrangements in construction work between his company and the contractor.

By Mr. JACKSON. I move to strike out the statement of the witness that Col. Scheidenhelm was there to negotiate for his company. The witness cannot know anything about that. All he can possibly know, if anything, is that Col. Scheidenhelm was there.

By Mr. JONES:

Q. Who was present at the time other than yourself, if you recall?

A. Do you mean at the whole conference there?

Q. No; who did Col. Scheidenhelm in your presence interview there that day about the business of the company?

A. A representative of the contractor.

Q. Who was the contractor?

A. The Dravo Construction Company.

Q. How long have you personally know Col. Scheidenhelm?

A. A year or two; I don't know exactly how long.

Q. How often have you met him?

A. At intervals over that time.

Q. Has he had any business at your office?

A. Yes, sir.

Q. How frequently during a period of a year have you seen him and has he had interviews with you?

A. Several times. I am not prepared to state without refreshing my memory as to how frequently.

Q. What was the occasion of Col. Scheidenhelm's visit to you or the purpose of his visit as he disclosed it to you?

A. My contacts with Col. Scheidenhelm have not always been on visits to our office. I remember there were two trips in which he came to the office, that is, in connection with this application for the Winfield license.

I have also met him a few times on the Marmet and London jobs when they were constructing those power plants.

4855 Q. Who, besides Col. Scheidenhelm, if anyone, was negotiating, if you know, for the Winfield license?

A. He was the only one, or he was the chief with whom I had any contact.

Q. What part did you have in these negotiations with respect to the Winfield license?

A. I did most of the engineering work for the division office, or it was done under by direction, in connection with this application.

Q. The application was from what company?

A. The Kanawha Valley Power Company.

Q. Has that contract been concluded for the licensing or for the operation of the dam?

A. I don't believe I understand what you mean by your question as to whether the contract has been concluded.

Q. The license for the operation of it, I mean.

A. The license has been issued by the Power Commission and accepted by the company.

Q. By the company?

A. Or by the licensee.

By the COURT. I do not see the materiality myself. It is provided in the license that the licensee is to pay a substantial sum, is it not?

By the WITNESS. $40,000, plus some other charges.

By Mr. JONES:

Q. In the course of this conversation with Col. Scheidenhelm was he discussing with you the annual charge that should be exacted from the power plant?

By Mr. JACKSON. I object to the relevancy of this evidence.

Objection overruled. Defendant excepts.

A. At what time—you mean in May?

1856 Q. In May, yes, sir; and at previous times.

A. At previous times it had been, but in May——

Q. I don't know whether I asked you before, but I will ask you now, when the license was concluded. Do you know?

A. I haven't that data at hand; no, sir.

Q. It had been concluded, so far as you know, prior

1857 to May 1936?

A. Prior to the 15th of May; yes, sir.

Q. In the prior conversation on these occasions in which Col. Scheidenhelm was there, where did you discuss with him, if you did, the terms of license, with respect to payment?

A. In the office of Division Engineer; Corps of Engineers, Cincinnati, Ohio.

Q. Who, if anyone, was with Col. Scheidenhelm at that time purposting to represent the Kanawha Valley Power Company?

A. On those times?

Q. At the time you speak of, in the Cincinnati office.

A. I believe one time he was there by himself, and one or two times he had Mr. Stearns with him.

Q. Is Mr. Stearns an officer of the Kanawha Valley Power Company?

A. I cannot answer that question.

Q. Who discussed and undertook to arrive at the figure, which we will term for a better word, rental, to go into this license?

A. Col. Scheidenhelm.

Q. Now the visit to Winfield, if I understand it correctly, was in reference to installation that was going on there by a contractor,

and was it the contractor of the Government, the Contractor of the Appalachian Electric Power Company or the contractor of the Kanawha Valley Power Company?

By the COURT. What is the question?

Q. Now the visit to Winfield, if I understand it correctly, was in reference to installation that was going on there by a contractor, and was it the contractor of the Government, the contractor of the Appalachian Electric Power Company or the contractor of the Kanawha Valley Power Company?

1858 Q. Who was the Dravo Construction Company contracting for?

A. Dravo contracts for the Government, for the construction of the dam. The Kanawha Valley Power Company had their contractor starting in on the construction of the Power House, within the confines of the Dravo coffer dam, and their work was adjacent and more or less tied in, but there were two contractors there.

Q. Now the Winfield dam project, part of the work was done by the government and part by the licensee?

A. Yes, sir.

Q. You were familiar with the terms of that contract?

A. Of the contract?

Q. I mean of the situation, I withdraw the word "contract".

A. In general, only in general.

Q. And it was at that time, in May, and in that situation that Col. Scheidenhelm had this conversation with you as to which I was about to interrogate you?

A. Yes, sir.

Q. Was it a part of your duty to ascertain what the operation of the London and Marmet dams would be, Mr. Davenport?

Q. What was your answer to that question?

A. My duties did call me there.

Q. Did your duties, relate to the Winfield dam or London and Marmet dams on that occasion?

A. On that occasion they related to the Winfield dam.

Q. Had you expected to meet Col. Scheidenhelm there, or was it just a casual meeting?

A. I went there expecting to be present at the negotiations between Col. Scheidenhelm and the Dravo people.

Q. Col. Scheidenhelm was negotiating with the Dravo people for what, and how were you interested in that, represent-

1859 ing the Government?

A. A District Engineer is a designated representative at that place and a division engineer is an official engineer and consequently I was interested in all of the negotiations that took place.

Q. What was the subject matter of the negotiations insofar as you knew, by reason of your being present, between a representative of the Dravo Company and Col. Scheidenhelm?

A. It was in connection with some construction work in which the Government did not have an absolute interest, but only an interest insofar as getting these two parties together, one of them being a licensee from the Government and the other a contractor to the Government.

Q. Then you were there on official duties at a conference between Col. Scheidenhelm and the Dravo people and the licensee was the Kanawha Valley Power Company?

A. Yes.

Q. And on that occasion, it was represented by Col. Scheidenhelm?

A. Yes, sir.

Q. What is the relationship between the Kanawha Valley Power Company and the Appalachian Electric Power Company?

By the COURT:

Q. You say the evidence is abundant throughout the record on that point?

By Mr. JONES:

Q. He can state, if he knows, of his own knowledge, that the Kanawha Valley Power Company and the Appalachian Electric Power Company are affiliated?

A. I think——

By the COURT: He can say whether he understands they are affiliated.

A. All right, I do understand they are, and have made a report to that effect that the Kanawha Valley Power Company is
1860 a subsidiary of the Appalachian Electric Power Company and that they are amply financed, in connection with this discussion we had.

A. I will have to admit I don't know whether they are affiliated or a subsidiary, but they are all in the same organization.

Q. And Col. Scheidenhelm was there representing that interest on that day?

By the COURT. All right then, certainly they have a community interest.

The witness stated he had made a report to his Chief Engineer that in all probability they were amply financed because of their connection with the Appalachian Electric Power Company.

Didn't you say that?

A. Yes, sir.

By Mr. JONES:

Q. Do you know Col. Scheidenhelm's signature?

A. Yes, sir.

1861 Cross examination by Mr. JACKSON:

Q. Mr. Davenport, you are a civil engineer and employed in the Division office in Cincinnati?

A. Yes, sir.

Q. And who are your superior officers there?

A. Officers?

Q. Yes, sir.

A. Colonel Roger B. Powell, Division Engineer; Lieutenant Colonel D. O. Elliott, Assistant Division Engineer, and Captain P. N. Strong, Military Assistant.

Q. Lieutenant Colonel John F. Conklin is Chief of the Huntington District, is he?

A. Yes, sir.

Q. And he has immediate charge of all the dams on the Kanawha River and the Ohio River in the vicinity of the mouth of the Kanawha River?

A. Yes, sir.

Q. How far upstream does his jurisdiction extend, do you know?

A. I believe it runs upstream to Dam 14.

Q. Inclusive?

A. As I recall; yes, sir.

Q. And how far downstream?

A. It includes Dam 28, and I believe, 29.

Q. He has actual direct charge of the operation of these dams, hasn't he?

A. Yes, sir.

Q. You do not personally have charge of or anything to do with the operation of these dams, do you?

A. No, sir; that would follow from your previous question.

Q. When did you go with the Engineer's Office in Cincinnati?

1862 A. In December 1933, on the formation of that Division.

Q. In December 1933?

A. Yes, sir.

Q. Have you been there ever since?

A. Yes, sir.

Q. You said you made investigations and study of low flows on the Ohio River and in the vicinity of the mouth of the Kanawha River. When did you begin those studies?

A. I would have to refer to my records. I believe it was early in 1935 or late in 1934.

Q. Wasn't it late in 1935?

A. No, sir.

Q. When did you complete them, if you ever did?
A. I believe they were completed late in 1935.
Q. And did you make those studies for the purpose of testifying in this case?
A. At that time, no, sir; I never expected to be a witness.
Q. You knew they were made for the purpose of use in this case, didn't you?
A. No, sir.
Q. You did not know that?
A. No, sir.
Q. Who told you to make them?
A. My superior officers, in the course of my duties.
Q. Who was that?
A. Who was the officer—I was designated by Colonel Powell. I don't know that this particular duty was assigned to me particularly. It was part of the duty that had been given to me sometime previously, after the formation of the Ohio River Division.
Q. Do you want to change your testimony as to when you started to make these studies?
1863 A. I told you that, without referring to the records, I would not be sure as to when it was. I have no reason to change my testimony.
Q. Colonel Powell told you to do this, did he?
A. This especial duty?
Q. Yes, sir.
A. It came from the Chief Engineer and, by routing slip, came to me.
Q. Now,——
By the COURT (interrupting.) The study of the river and the compilation of these things?
Q. You testified that these estimates which you have undertaken to make for the Kanawha River, are based upon gauge heights shown in Government's Exhibits 110 and 111, didn't you?
A. Partially; yes, sir.

By Mr. JACKSON:

Q. I said Ohio River—didn't I?
A. There was no argument about your question. There was no argument about the adequacy of your question.
Q. Read the question. [The question is read.] I referred to the Ohio River?
A. Yes, sir.
Q. What other data did you have—these charts [indicating]?
A. Yes, sir.

Q. And what did you learn from the charts—Exhibits 221 to 221–E, that you used in making your estimates?

A. From the charts I obtained the cross-sections and distances on the river.

Q. That is the only purpose served by these Exhibits 221 to 221–E, is it?

A. Water elevations and depths and distances, all is shown—can be obtained from the data printed on these charts.

Q. You gave a good many figures for the estimated
1864 flow of the Ohio River at Pool 25, during 1918, did you not?

A. Yes, sir.

Q. And in these, for instance, you included figures for Lock 25—for July—for August, 1918, didn't you?

A. Yes, sir.

Q. And in arriving at those figures, you used Government Exhibit number 111?

A. I believe so.

Q. And doesn't that Exhibit show, on its face, that construction work was going on throughout August, 1918?

A. If it is on there, that is correct.

Q. In making your estimate, did you look to see?

A. I took the gauge figures without regard to the construction work.

Q. You paid no attention to the construction work?

A. No, sir.

Q. In your opinion, does it make any difference if construction work is going on at a Lock where a gauge is?

A. Yes, sir.

Q. It will affect the accuracy of the readings of the gauge, wouldn't it, in relation to the flow?

A. Affect the accuracy of the gauge—no, sir.

Q. It will affect the use of the readings shown by the gauge for the purpose of determining the flow, will it not?

A. Possibly it would; yes, sir.

Q. You know—not possibly—but you know that if you have construction work going on on a river at a lock where there is a gauge, it will affect the readings for a given flow, do you not?

A. Not necessarily.

Q. It certainly will vary very frequently, will it not?

A. Yes, sir.

Q. And you made no allowance and had no means of making any allowance for that?

1865 A. No, sir.

Q. As a matter of fact, all that this Exhibit III shows is one reading of gauge at 8:00 o'clock in the morning?

A. No, sir; each day.
Q. This is each day?
A. Yes, sir.
Q. You had no continuous reading of the gauge at—in August 19, for Lock 25, did you?
A. Every day.
Q. Is that continuous?
A. What do you mean "continuous"?
Q. Continuous recording gauge?
A. No, sir; there was not any there.
Q. So far as this single reading is concerned, there might be wide fluctuation in stage throughout the day, might there not?
A. Yes, sir; that is possible.
Q. Did you observe that you got your lowest estimated flows the Ohio River in 1918?
A. No, I haven't made any study of that.
Q. If it be a fact that your evidence shows that your estimates the flow of the Ohio River for the various times that you have ndertaken to testify about, were the lowest in 1918, would that dicate to you that you had been using some unreliable data—ch data that was affected by the construction on the river?
A. Not necessarily.
Q. Would you think that a possibility under these circumances?
A. Possibly?
Q. Yes.
A. Yes, sir; that might be possible.
Q. And there might be a good many other things that ould affect that, and you have no means of determining it from is chart [indicating], have you?
A. Other things that might affect the gauge reading?
Q. Yes, sir.
A. That is right.
Q. That is the deduction from the gauge reading?
A. Yes, sir.
Q. For instance, all your figures for 1930, are flows, as I have ted them, of nothing less than 2,050 second-feet—in the Ohio, ove Kanawha, 2,690 second-feet; 2,755 second-feet; 3,130 second-et and 2,640 second-feet—they are much higher than your ures for 1918—wouldn't that very fact indicate to you that ur estimates for 1918 show a substantial error?
A. No, sir.
Q. And for other years, prior to 1930, wouldn't you reach same conclusion, from the discrepancy between these figures 1930 and your figures for earlier years?
A. No, sir.

Q. I read to you, Mr. Davenport, from House Document, No. 306, 74th Congress, First Session, being the so-called 308 Report, of the Ohio River, at page 148, as follows. [Reading:] "The flow of the Ohio River was, in general, lower during the fall of 1930, than it has ever been since records of this nature have been kept," and I ask you whether or not that shakes your confidence in the estimates or computations that you have undertaken to make of the low water flows on the Ohio River prior to 1930?

A. No, sir.

Q. You disagree with the statement in this report of the Army Engineers, that the low water flows in 1930 for the Ohio River was lower than since records have been kept?

1867 A. Not at all; no, sir.

A. (Continuing.) That would not cause me to feel that my earlier flows were—or calculations rather of the flows—were in error. As you may know, from previous testimony, we use the Manning formula for the determination of flow. In low flows, this Manning formula is not—may not give as close results as I would show. However, it is a most accurate method—the most accurate method available for determining flows, with the data and under the conditions which are available for these periods. Now, it is possible that the 1930 flows may have been liberally long in arriving at the figures I have submitted. In 1918, the flow being Open River, would probably give a more exact determination than it would in the pools during the year 1930.

Q. Would it not be fair to say that determination by use of the Manning formula, is simply the best guess you could make with such data as you had at hand?

A. I object to your use of the word "guess."

Q. Mr. Davenport, of course you know that the Manning formula requires the use of a constant?

A. Yes, sir.

Q. And you know that the constant is selected by the Engineer making the computation?

A. Yes, sir.

Q. And that it is selected as a matter of judgment, at best?

A. Yes, sir; or experience either.

Q. And the only way you can check the accuracy of these theoretical computations from the Manning formula, is to actually make the measurements at the point later on and see if that constant you have used is right, by mathematical process?

A. Later on?

Q. Yes, sir.

A. No, sir—the determination of the measurements made

1868 previously—there is no requirement that we make a determination later on.

Q. If you had the actual measurements before you would not use he Manning formula?

A. When this happens; yes, sir. I have no other method as ccurate as the Manning formula for making these computations.

Q. That is because you haven't the data to do anything else?

A. Yes, sir.

Q. You were asked if there was any better method of making determination of stream-flows than the matter of estimates such s made by Mr. Pierce, and you made the fanciful assertion that erhaps one might bail the water out of the river in buckets. Don't you know that, if one wanted to make an accurate deter-ination of stream-flow at the mouth of the Kanawha River, the roper scientific way would be to put gauging stations there and ake concurrent stream-flow measurements, which could be ap-lied to the gauge readings?

A. If you can devise a method by which you can go back to 918 now or later on and make such determination, I would be lad to see it.

Q. Of course, you could not go back and find that such data or 1775?

A. I would not be able to. I did not search for that.

Q. That would not change the engineering fact, would it, Mr. Davenport, that if one were going to take an accurate measure-ent on stream flow, and not an estimate or computation, the way o do it—the accepted way—would be to establish a gauging sta-ion at the place you wanted to know the stream flow, and make a oncurrent stream-flow measurement that could be related to gauge eights?

A. That is a very accurate way to do it and the accepted method.

869 Q. You undertook to describe Mr. Pierce's method—that he took the flow at Kanawha Falls, and then he used the ata at some further down gauge stations of the drainage area elow for 1918, and arrived at a figure for the mouth of the anawha—did you have or use a single gauging station or think hat there was a single gauging station in the Kanawha Valley elow Kanawha Falls, upon which he could base an estimate for 918?

A. I believe I said that I was simply giving my expression of Mr. Pierce's method, as I had gained them.

Q. Don't you know it to be a fact that the only gauging sta-on down stream below Kanawha Falls in the Kanawha Valley, as on the Cole River, with a drainage area of 375 square miles?

A. I don't know that.

Q. And that was out of a total of 4,000 square miles of drainage ea?

A. I am not competent to answer that; I am not prepared to answer that question. The previous question.

Q. You say your estimates of the flow of the Ohio were from the gauge readings from dam 25?

A. Yes, sir.

Q. How did you convert these gauge readings into stream flow?

A. By the use of the Manning formula.

Q. Give me an illustration as to how you did that. Take a gauge height of 6.3 on the gauge at dam 25, and apply the Manning formula.

A. Are you familiar with what we mean by back water curves?

Q. I have heard the engineers explain it.

A. That is by means of back water curves, together with the cross-sections of the stream we made up from the charts.

Q. You have one figure that may or may not be right, but it is a gauge height on Exhibit 111 for August 1918. What other

1870 things did you have? What other known facts?

A. The cross-sections of the stream.

Q. Where?

A. Throughout Pool 25, as obtained from the chart.

Q. In addition to the cross-sections, what other known fact did you have?

A. Our experience with stream flow.

Q. What other known fact did you have about the Ohio River—that is, the gauge heights or flow in 1918, on pool 25, which went into your estimate of low water flows, besides the gauge heights and cross-sections?

A. The length of the pool.

Q. What else?

A. Our experience with flows on the Ohio River and other streams.

Q. Did you have a rating curve?

A. No, sir.

Q. You did not use a rating curve?

A. No, sir.

Q. There is no rating curve for Lock 25, is there?

A. There was not any available to me when I had these determinations made.

Q. Did you try to find one?

A. Yes, sir; I have attempted to get all the information possible, and this was the best data I was able to obtain in making these determinations.

Q. It is fair to say that you did the best you could with the difficult and speculative problem given you?

A. Yes, sir.

Q. And you were asked to do it with scanty data that necessarily involved a great many assumptions of judgment as best you could from your experience?

A. I did practically as you say, when I considered all the data of the periods under consideration.

1871 H. G. GERDES (recalled)

Direct examination by Mr. THOMPSON:

Q. You have been on the stand before, and have been sworn, have you not?

A. I have.

Q. Mr. Gerdes, please state to the Court whether you have made studies of the economic coordination of steam and water plants in supplying power to large utility plants?

A. I have. I made studies of the economic coordination of steam power plants of different characteristics, of hydro-electric power plants, both storage and river-run, in several areas; of steam and water power plants serving domestic, industrial and commercial loads. I have also studied interconnection of these public utility facilities.

Q. Please name some of the studies you have made?

A. I have made such studies in connection with the power which is presently to be available from the Bonneville project, now being built on the Columbia River, Oregon, and I have also made such studies in connection with the Philadelphia Electric Company system, in Pennsylvania, which contains both a large hydro-electric plant and steam plants.

I have also studied the economics of the interconnection of that system with the neighboring public utility systems in New Jersey and Pennsylvania.

I have made similar studies of the Safe Harbor Baltimore Consolidated Public Utility System and the Alabama and Georgia Power Company systems.

Q. State whether or not these studies involve consideration of the relative economy of carrying peak loads?

A. These studies were made for the Federal Power Com-
1872 mission, and they involved in each case as one of the most important factors the consideration of the plant or plants
1873 best suited to carry the peaks of the respective system loads.

Q. Have you studied the movement of waves traveling along rivers and similar bodies of water?

A. Yes, I have, for many years. One of my first jobs was to consolidate existing information and correlate data for use in preparing forecasts of flood waves in the Sacramento River, in

California. Later I have had frequent occasion to investigate and study flood and power waves in rivers, among others the San Joaquin and the Sacramento Rivers in California; the Klamath River in Oregon, the Eel, Van Duzen, and Mad Rivers, also in California.

In 1930 I had charge of a tidal hydraulic survey of San Francisco Bay and the lower reaches of the Sacramento River, which involved a very searching investigation of the phenomena of transitory waves moving in that body of water.

This work all deals with the same subject, and the phenomenon of power waves in New River is a specific case of this type.

Q. I hand you, marked for identification "Government Exhibit 223," with this legend on the right-hand corner, "Federal Power Commission, National Power Survey, Principal Generating Plants and electric transmission lines, United States, 1935," and ask you what that is?

A. This is a map, which shows, as the title indicates, the principal electric generating plants and transmission lines, including, among others, those of the Appalachian Electric Power Company and the systems with which it is connected.

The inner circle of the 120 mile radius covers approximately the service area of the Appalachian Electric Power Company and its own transmission lines.

The larger circle of 200 mile radius covers the same territory, and includes the transmission lines and generating plants with which energy is interchanged.

* * * * *

1874 Mr. THOMPSON. If the Court please, we offer this plaintiff's Exhibit No. 223 in evidence at this time.

Mr. JACKSON. We object to it as immaterial.

The COURT. Let it in.

Mr. JACKSON. Exception.

WITNESS. This exhibit shows the principal transmission lines of the Appalachian Electric Power Company within the inner 120 mile circuit, Cabin Creek, Logan and Kenova Steam Plants on the north connected to the Philo Steam Plant of the Ohio Power Company, in southern Ohio. The Ohio Power Company is an affiliate of the Appalachian Electric Power Company.

By Mr. THOMPSON:

Q. How far is the Ohio from the Appalachian Electric Power Company?

A. Approximately 150 miles from the northern group of the Appalachian Electric Power Company plants. This group of steam plants serves principally the industrial area along the Ohio River.

By Mr. THOMPSON:

Q. Are there minor plants along there?

A. Yes; there are also minor plants. To the south there is shown the Glen Lyn steam plant of the Appalachian Electric Power Company and the Buck and Byllesby hydro-electric plants. still within the 100 mile circle, and reaching south to the Waterville plant of the Carolina Light & Power Company.

Q. Can you tell the Court where the Waterville plant is?

A. It is in North Carolina near the boundary line between North Carolina and Tennessee. As will be shown in a moment, the only substantial energy receipt of the Appalachian Electric Power Company comes over this line, and over the line which is shown on the map reaching from the vicinity of what is labeled Norris dam to Waterville.

Q. I hand you, marked for identification "Government Exhibit No. 224," the legend on it showing the States in which electric service is furnished.

1875 A. This is a map of the service areas of the various utility companies, and its purpose in connection with the present proceeding is to identify more closely and directly the service area of the Appalachian Electric Power Company and the utility companies adjacent to it.

Q. I hand you, marked for identification "Government Exhibit No. 225," consisting of one page, with this statement at the head, "Government Exhibit —, energy transactions between Appalachian Electric Power Company and interconnected systems, 1934," and ask you whether you prepared that, or not?

A. I did.

Q. What does that diagram purport to show?

A. This diagram shows the energy transactions between the Appalachian Electric Power Company and the companies with which it interchanged power in the year 1934, and also shows, for the purpose of illustration, the magnitude, whether large or small, of energy transactions between certain of these other companies and power companies located yet more distantly from it.

Q. You speak of other companies: What other companies do you mean?

A. I have specific reference to the Tennessee Valley Authority, Alabama Power Company and Georgia Power Company.

Mr. THOMPSON. I offer this in evidence at this time—Government Exhibit No. 225.

Mr. JACKSON. We object to it as immaterial.

The COURT. Admit it.

Mr. JACKSON. Exception.

WITNESS. It will be noted from this diagram that the Appalachian Electric Power Company has a substantial power inter-

change with its affiliate, the Ohio Power Company on the north——

1876 By Mr. THOMPSON:

Q. Let me ask you about the Ohio Company: Does it have any hydroelectric project?

A. I don't think so—certainly no major one.

Q. It is of steam?

A. Yes; and these energy transactions, shown on this diagram, practically balance out, being in the nature of daily or weekly swings of power between the two companies.

Q. Look down at the Alabama Power Company: Has it, or not, a direct connection with the Appalachian Electric Power Company system?

A. It has not.

Q. How does its power, if at all, reach the Appalachian Electric Power Company?

A. No power from the Alabama Power Company reaches the Appalachian Electric Power Company. These two systems, as is common with public utilities systems generally, or at least to some extent, are operated in parallel; that is, the systems are physically connected together so that the customers living in the border line territory between the Appalachian Electric Power Company and the Tennessee Public Service Company, and between the Tennessee Public Service Company and the Tennessee Electric Power Company, and between the Tennessee Electric Power Company and the Alabama Power Company, may, in each case, receive a somewhat more reliable service, and with this the adjacent companies in each instance may benefit to some degree by the mutual production arising from the pooling of their resources. However, from this diagram it is to be observed that there are two utility companies intervening between the Appalachian Electric Power Company and the Alabama Power Company in addition to a physical length of some 500 miles of transmission line. This latter fact
1877 alone, if nothing else were to intervene, makes the transmission of power from the Alabama Power Company to Appalachian Electric Power Company economically altogether infeasible.

Q. Now, look at the Georgia Power Company: has it any direct connection with the Appalachian Electric Power Company for transmission purposes?

A. The Georgia Power Company is situated in approximately the same relation to the Appalachian Electric Power Company as the Alabama Power Company. Further describing, you will note from this diagram that, in addition to the physical distance of the Alabama Power Company from the Appalachian Electric

Power Company, these interchanges of power with its nearest connected utility, the Tennessee Electric Power Company, are very minor. The interchanges of the Georgia Power Company with the Tennessee Power Company are also minor, and it may be further stated that, though not shown here, the Alabama Power Company supplies the Georgia Power Company a considerable portion of its power and receives a substantial part from the Tennessee valley on a short term contract.

All of these circumstances taken together render it practically impossible for Appalachian Electric Power Company to receive any substantial amount of power from the Alabama or Georgia Power Company.

Q. I note on there the Aluminum Company of America; what is its situation with respect to the Appalachian?

A. During the year 1934, the principal net power receipt of Appalachian Electric Power Company was 312,000,000 kilowatt-hours from the Tennessee Public Service Company, which has no generation of its own and is a transmission and utility system. Approximately half of this power came from the Waterville plant of the Carolina Light & Power Company, which is shown
1878 between the two circles on the transmission map, and another half came from the eastern end of the Tennessee Electric Power Company systems, being received from the nearby Calderwood plants of the Aluminum Company of America.

I would like to say here that, as is well known, Tennesseee is a long State, and the system of the Tennessee Electric Power Company is pretty well split into two halves, and whereas the Alabama company comes into the western half, this power that we are talking about comes into the eastern half some 200 miles distant.

Q. That is distant from the western half?

A. Distant from the western half. In eastern Tennessee is the Calderwood plant of the Aluminum Company, which company sells to Tennessee Electric Power Company, which transmits to Waterville and sells over the lines of the Tennessee Public Service Company, together with a part of the output of the Waterville plant, a certain block of energy, shown on this diagram, which goes north through Tennessee and Virginia.

Q. State whether or not, if you know, what the situation was with respect to the Aluminum Company in 1934, when it was selling its power?

A. The Aluminum Company, as is well known, makes electricity for its own use in manufacturing, and this block of power sold is a block of what might be called depression or distress power, which is sold at any price obtainable, when its owner or developer is not in position to use it for the purpose for which the plant was.

built. A certain part of the power from the Waterville I believe to be in the same category.

The COURT. Mr. Thompson, may I inquire the materiality of all of this evidence?

1879 Mr. THOMPSON. One of the questions which counsel asked Mr. Kramer was, "Don't you know that power can be purchased and supplied by the Georgia and Alabama companies to the Appalachian Electric Power Company," and we are trying to show that that situation is practically impossible.

The COURT. If so, what?

Mr. THOMPSON. So if you have peakload operations, your peakload operations will have to come from the Radford project.

The COURT. Go ahead.

WITNESS. Summing this entire matter up, this power is purchased on an energy basis at a very low price of not less than one mill per kilowatt-hour. The terms of the contract are ambiguous, but the price is somewhere between three-fourths of of a mill and one mill, and the entire picture of power received by the Appalachian Electric Power Company is a picture of "temporary convenience, distress, dump and interchange power," as it is variously termed. In other words, not a firm or reliable power supply.

Q. (By Mr. Thompson) And by "firm" you mean dependable?

A. A dependable power supply.

Q. Mr. Gerdes, I refer you now to plaintiff's Exhibit No. 204, and ask you if you are familiar with it?

A. I am. This is a study of the operation of the Radford and Bluestone reservoirs during the dry season of 1930, showing how it is possible to operate the Radford reservoir so as to prevent Bluestone reservoir from fulfilling its function of providing a regulated minimum floor of 2000 cubic feet per second in New and Kanawha Rivers below the dam.

Q. State whether or not it would have been possible to have the Radford reservoir emptied on June 24, 1930, as shown on Exhibit 204?

1880 A. Yes, it would be entirely possible. During the month of May and from June 1 to June 23, 1930, the average flow at the Radford dam site was 1770 cubic feet per second; the hydraulic capacity of the plant was 9,000 cubic feet per second; and assuming there was a storage at Radford on May 1st of 100,000 acre-feet of water, operation of Radford power plant at full load for only 7.2 hours per day would have used up the stream flow and emptied the working storage of 100,000 acre-feet.

Q. By what time?

A. June 24th.

Q. How many days is that?

A. 54 days. That would not be an impracticable operation in any sense.

Q. What do you understand by a "rule curve" in operating a hydroelectric peak plant such as Radford?

A. There is no such thing as a fixed rule in operating a hydroelectric peak plant. From the past records of water supply, there are laid down certain general guides, but the operation of the plant is determined by the supply of water available from day to day and by the demands of the system to which the power plant is connected. Ordinarily either the load dispatcher of the utility company, or perhaps an operating committee of the executive officials most concerned, meet weekly and decide upon the position and sequence of operation of the plants of the company for the week. These plans are flexible, are motivated by a desire to get the most energy out of these plants for the least expenditure of money, and they are changed weekly, and frequently daily or even hourly. It is a continuous business of planning. An electrical storm, or breakdown of system, blowing out a transformer, a circuit breaker anywhere, or a sudden rain—all of these things frequently cause changes in these operating plans.

1881 Q. What would you say as to whether the Bluestone, if operated on a minimum 2,000 second-feet requirement, for the regulation of navigation, would be on a rule curve?

A. Well the Bluestone reservoir is in a different situation, its intent is for use as a flood control and navigation relief reservoir, and in so far as navigation is concerned, the requirements of navigation are known, and are constant, namely a minimum depth of water, and the reservoir can be operated on a fixed rule to provide minimum regulated flow of 2,000 second-feet. That is a requirement known in advance.

Q. Do you know of any rule curve by which the Radford project has been planned to operate?

A. I do not.

Q. You never have heard of one?

A. I have not

Q. Wherein does the proposal for the operation of the Radford project differ with the proposal for the operation of the Bluestone project?

By Mr. JACKSON. That question is objected to because the witness doesn't know what the proposal for the Radford project is, by his own testimony.

By Mr. THOMPSON. The witness can testify from the proposal of plants, Declaration of Intention, and application for license, as to how he understands this project will be run.

By Mr. JACKSON. There is nothing to show he knews anythi about the proposed operation of the Radford project.

* * * * * * * * *

Q. Have you read the Declaration of Intention in this case, fil by the Appalachian Electric Power Company?

A. I have.

Q. Have you read the application for license?

A. I have.

Q. Have you studied the maps connected with them?

A. I have.

Q. Have you read the hearing before the Virginia Power Cor mission on the application of the Appalachian Electric Pow Company for license?

A. I have.

Q. Have you visited the site of this project?

A. I have.

Q. State, from you experience then, wherein you think, if yo do, the Appalachian Electric Power Company project, as propose by the defendants at Radford, will differ, will operate differentl from the Bluestone project?

By Mr. JACKSON. I renew my objection. It is immaterial wh he thinks.

By the COURT. Mr. Thompson, what you are getting at, is havin this witness compare the methods of operation at the Blueston project, with the Radford project. Now as to how the Radfor project will be operated in the future must be a matter of conjec ture, because no proof of how it has been operated; it is not i existence. I think the witness would have to take into considera tion, if you think it is a matter of willingness or self-determinatio on the part of the Radford project operators, certain condition they have already told the Power Commission they would acced to and carry out.

By Mr. THOMPSON. I would like to know what that is. The have never told the Commission anything about a load curve

By the COURT. Your witnesses have previously testified, in ef fect, the Radford project will be operated by impounding all th water for long periods of time and releasing it in great waves seriously detrimental to interests below, and that is mere surmis and conjecture on their part it would be operated that way. I a witness is going to testify how a plant will be operated he mus take into consideration all the known conditions and declaration of the parties as to how they intend to operate it. Now as I understand it, the defendant here, following its Declaration o Intention and Application for License, tendered one containing certain conditions proposed by the Water Power Commission and that is indicative of the fact that is the manner in which it

intends to operate its plant, and we cannot ignore that for the future.

By Mr. THOMPSON. I must say, with all due respect, I cannot go that far. I don't understand they have conceded—they say in their reply letter they will operate under reasonable rules. They didn't say what those rules were or let the commission decide [interrupted].

By the COURT. Weren't certain conditions imposed in the license?

By Mr. THOMPSON. Yes, sir, but they objected to many of the conditions in the license. They offered to accept a minor part license, but not the major license.

By Mr. JACKSON. We offered to accede to the conditions regulating flow or discharge as contained in the draft of the minor part license, and as contained in the draft of license last tendered to the defendant.

By Mr. THOMPSON. And in that acceptance they said they would subject themselves to reasonable rules and regulations. Suppose you have that up and down the river—operating on the basis of reasonable rules and regulations—how are you going to regulate the flow of the river so you can regulate it below or control the situation of flood control, with the question of reasonableness left up in the air?

By the COURT. I can't help but think you are raising a considerable bogey in the idea the Radford project will shut off great volumes of water for long periods, to the destruction of navigation in the stream below, as a practical proposition, because I think you and everyone else would concede the fact if they did that, the Government would go in there and tear out that dam.

By Mr. THOMPSON. I do think that, but the Government can't wait on a situation of that kind to go in and tear out a dam. That is the situation in this case. If we go back to Section 23 here in this application—they are asking for something—and it may be said it is a nonnavigable river, and will not affect navigability, but if it is on a river that is navigable they have to come to certain agreements, and further, under section 23, if they come in and the Commission makes an investigation and finds it will affect certain conditions, then they have to accept certain agreements.

By the COURT. My objection is this, the witnesses come in here testifying in regard to what their belief is as to how a plant is going to be operated, when the preceding course of events has indicated an intent and willingness on the part of the defendant to operate the plant in a different way.

By Mr. THOMPSON. Can you point to me any point where they agreed to let the natural flow of the river go down?

By the COURT. No.

By Mr. THOMPSON. Did the Deakyne report say they should allow 535 second-feet to go down during certain periods of time, and when conditions below arise the War Department will order them to let all the flow go down? They have not accepted that. If they will come in and agree to let the natural flow of this river go down in low-water times, that is another thing. They have not done that.

By the COURT. I don't know all the conditions in the license which were accepted and which were rejected.

By Mr. THOMPSON. We are putting this witness on as an expert. If they can break him down, his evidence goes out. We are putting him on as we did other witnesses, including Col. Watkins, to show they cannot operate this project economically or successfully unless they operate it as a peak-load proposition, and then we are contending they cannot run it on this average minimum flow of theirs, and I am trying to make the distinction by this witness, the difference between the way the Bluestone would be operated and [interrupted].

By the COURT. You are attempting to have this witness state on the witness stand a different manner in which two plants are going to be operated, neither of which have been operated, or are in existence, so he has nothing to go by, except his own opinion and surmises. He ought to have stated to him and take into consideration all known conditions relating to the Radford plant.

By Mr. THOMPSON. We have introduced in evidence the hearing before the Virginia Commission. He said he had read and studied that. There is a recommendation by Col. Scheidenhelm as to how he thinks this project will be run. Now accepting his statement, as we understand it, we are asking him in view of that, and of the Declaration of Intention, what kind of operation they will have there as compared with the operation down below, and I am trying to bring out for your Honor's benefit a contrast showing one does operate under a rule curve and the other doesn't.

By the COURT. I will let him answer.

By Mr. JACKSON. I want to make this suggestion. He is asked to make a blind comparison. I think if he is going to be asked to make a comparison, he ought to first be given a hypothetical statement, assuming some kind of operation at the Radford plant, or at least asked how he assumes the Radford plant would be operated, then he could compare that assumption, but now he is asked to compare something no one knows in the record what it is with something else no one knows what it is.

By Mr. THOMPSON. I have asked him if he has read and tudied this Declaration of Intention, the Application for License, the hearing before the Virginia Power Commission, and ll those other documents, and the study of the plans he made imself. I think I have laid the foundation.

By the COURT. Am I mistaken in believing that somewhere in he negotiation and discussion between this Defendant and the Power Commission some term was discussed with regard to 9,000 cre-feet discharge?

By Mr. JACKSON. In the draft of the minor part license, and icense last tendered, May 1931, there is a paragraph that specifies what releases shall be made weekly, the discharges, and we have ad that identified, but have not yet had an opportunity to offer t in evidence—our willingness to accept those conditions as to lischarge and our unwillingness to accept other conditions, such s recapture, etc.

By Mr. THOMPSON. Does that go to the crux of the situation? Doesn't that leave the question again up in the air.

By the COURT. Mr. Thompson, your witness, Mr. Johnson, I hink, presented a diagram here. In making up that diagram he lid not take into consideration, as I understand it, the release of his 9,000 acre-feet, did he, at the Radford plant?

By Mr. THOMPSON. What he did, as I recall the testimony, was o take into consideration the economical operation of that plant, he most economical operation.

By the COURT. The trouble is, your witness is testifying here bout a condition which apparently will not exist. Now your witnesses are testifying about what the Radford project could lo, going to an extreme, in disregard of the conditions in the river below, by disregarding preceding events, and some of record show they have indicated an intention and complete willingness to operate differently, and your witnesses are not taking hat into consideration.

By Mr. THOMPSON. They say they will operate under certain onditions, but when they come in under Section 23, the Government is the one to lay down the conditions.

By the COURT. And one of those conditions the Government aid down is there shall be released from the Radford project t least 9,000 acre-feet weekly, and they have agreed to do that. low why is it fair to go ahead with a lot of testimony disregarding that and proceeding on the assumption they are going to withhold all the water and not comply with that condition.

By Mr. THOMPSON. Because they say they will operate on an verage basis, and that average may be above or below, and we on't know what it will be. They say they will do it.

By the COURT. I am talking about evidence based on assumptions, which I think are contradicted by known facts, it detracts a great deal from the weight of the evidence.

By Mr. THOMPSON. We don't know their known facts.

By the COURT. One is they agreed to release this certain amount of water. They agreed to a condition which involved the release, whether regular or irregular, I don't know, of at least 9,000 acre-feet of water a week, did they not?

By Mr. GATCHELL. May I state the first license proposed this 9,000 acre-feet release for a week, that was the license tendered on July 1, 1927. It was for a major project, and was refused by the company. The Executive Secretary of the Commission in 1930 tendered them two minor part licenses, neither of which was authorized by the Commission. He expressly informed them the Commission had not approved the tender of those license. The minor part license was acceptable to the company, and as shown by Exhibit #542 Col. Scheidenhelm wrote to the Commission and said that minor part license contained terms acceptable to the company—he was speaking for the company, and it was on his letterhead, and it is not in evidence yet. The next license, which was considered at all, was a major license, tendered by the New Commission in 1931, and that contained the provision of a daily release of so many acre-feet, 1,150 acre feet. Now, Your Honor will appreciate you may release 1,150 acre-feet in a day by shutting down a plant that has a hydraulic capacity of 9,000 cubic feet per second, shutting it down eight hours a day or more, and then releasing that whole block during the balance of the time, but during the day you release exactly the amount that is prescribed. Now all we are saying is the economical method of operating this plant would call for a certain peak load operation, and that peak load operation may be carried on under the very terms permitted, but the license tendered, even the minor part license tendered in 1930, and never authorized by the Commission, said the releases should be subject to the approval of the Secretary of War and Chief of Engineers, so that in the event this very condition arose, an extremely low period approached, and the company was withholding the water during a part of the day and releasing it for the balance of the day, then the Secretary of War could at that time, without going into Court, could write them and order them to release the water as it was needed, and as to that requirement they have never accepted. There is nothing in the record to show they will accept that requirement the Secretary of War may any day tell them they must send down a certain amount.

By the COURT. Did not they agree to the condition to release 1,100 acre-feet per day?

By Mr. GATCHELL. That was in the minor part license, not authorized by the Commission, Col. Scheidenhelm got for them, the company has never communicated with the Commission, but Col. Scheidenhelm did.

By the COURT. If that 9,000 acre-feet a week or 1,150 a day is released, it will flow down the river to the Bluestone dam and yet the witness comes in with a diagram which does not take any of that into consideration at all.

By Mr. GATCHELL. I don't know that is quite true—this chart is based upon the economical operation of the Radford plant under which they might release exactly the minimum required under that license tendered in 1930, the minor part license; but also bear in mind that under that very license that was tendered they had to submit to the instructions of the Secretary of War with respect to the release of water, and they could shut off their plant entirely for sixteen hours a day, under that license, and under the Virginia license, and not have a drop of water go down past this dam for a long period each day, and could have their peak operations, and that would flow into this Bluestone reservoir. Exhibit #204 is based upon that assumption, which takes into account the approval in the minor part license.

By Mr. JACKSON. I am sure counsel will agree, and if not, on refreshing his recollection, he will agree that the article of the so-called minor part license, whether authorized or not, relative to discharge, is the same as the one in the tendered license, Plaintiff's Exhibit #131, tendered May, 1931, as the letter of transmittal shows, and that provides, in Article 15:

"Whenever the flow at Lock No. 2, Kanawha River, falls below 1,400 second-feet, the Licensee shall, when so directed by the Secretary of War, discharge in each 24 hours the natural flow of the river at the dam site during that period up to a discharge of 1,150 acre-feet. The discharge from the project shall at all times be regulated by such rules and regulations as the Secretary of War may prescribe to prevent undue interference with navigation on the Kanawha River."

I don't think there is any change in that from the one in the so-called minor part draft.

Now counsel said it was on that kind of assumption this Exhibit #204 was prepared, which starts with the perfectly preposterous assumption that you enter the low-water season with an empty reservoir and shut off the reservoir entirely from June 23 to August 24, and counsel says that takes into consideration the discharge of 1,150 acre-feet per day, whether peaked or not does not have anything to do with the situation presented by this chart #204. The further preposterous assumption of again emptying the reservoir during lowwater season and shutting it down entirely,

would be in the teeth of the consideration counsel now says was taken into consideration in making this assumption.

By Mr. GATCHELL. All we say is when Col. Scheidenhelm said in 1927 the economical way to operate this Radford plant was on a peak load basis he was right, and this plant may be operated on a peak load basis—the flow of the river is sufficient to supply all the requirements of the Virginia license—it may be possible to shut down this Radford plant for an extended period.

By Mr. THOMPSON. May I add, we put forth this as a possible condition. We didn't say it was a normal situation, but a possible condition. If your Honor will remember I read first of all from the statement of General Taylor, and in it he said they have flows down for an indefinite period, and three times they referred to him as a part of their defense in the answer, so I thought I was well within my rights, and we were taking an indefinite period and expanding that to a period of fifty-four days. Now in addition to that they sought out a license from the Virginia Commission, which permits that to be done. We don't say it will be done every year, but it is a possibility.

By Mr. GATCHELL. This Article 15 which has just been read speaks of the flow at Lock No. 2. The flow at Lock No. 2 will never fall below that requirement so long as the Bluestone is discharging the minimum prescribed under its rule of operation. As long as they discharge the 2,000, the Radford plant can shut down entirely, and not be required to comply with the terms of that license. This chart takes in exactly the terms of that license.

By the COURT. That is the condition the Government arrived at itself as that sufficient for protection of navigation.

By Mr. GATCHELL. On the assumption the company would accept the license.

By the COURT. And a condition I understood the company acceded to. Go ahead. I think, as Mr. Jackson suggested, when this witness goes to compare the operation of the two plants, he should make us acquainted with the assumptions he is making.

NOTE.—The following question was read:

Q. State, from your experience then, wherein you think, if you do, the Appalachian Electric Power Company project, as proposed by the defendants at Radford, will differ, will operate differently, from the Bluestone project.

By Mr. JACKSON. I object to the form of the question. I think he should first ask how he assumes the Radford project will be operated?

Q. I will ask you this. In your opinion, as an expert, is the proposed Radford project of the Appalachian Electric Power Company suited for peak load operation?

1882 A. I will answer that it is.

Q. Can you give an illustration?

A. I will illustrate: The Radford project is a typical storage hydroelectric plant, and I as all others experienced in hydroelectric engineering, would have no doubt in saying conclusively that that plant could only be used profitably to return an income on the money invested in it, if it were employed in peak load operation.

By Mr. JACKSON. I move to strike out the part of the answer undertaking to say what other people experienced in this field would state.

A. May I state that as my own opinion then.

By Mr. JACKSON. I think that would be better.

A. I would like to illustrate: The Radford project is estimated to cost $12,000,000, which for 75,000 KW installed capacity, amounts to $160.00 per KW. It is well known among
1883 hydroelectric engineers that few, if any, hydroelectric plants costing in excess of $200.00 per installed KW are at all feasible. I have here the cost of a number of representative hydroelectric plants [interrupted].

By Mr. JACKSON. I object to that, and move to strike out further testimony of the witness about what is well known among hydroelectric engineers. I think he should confine himself to such information as he personally has.

By the COURT. It may be an accepted, known fact in the engineering profession.

A. I have personal knowledge of the cost and installation of a number of hydroelectric plants similar to the Radford plant. These plants are [interrupted]——

By the COURT. Let's not go into anything about the cost of other plants.

Q. What is the average cost per KW——

By Mr. JACKSON. I object to that. [Question read.]

By the COURT. I would permit him to say it was generally accepted in the profession a plant costing more than $200.00 per KW unit of production was not profitable, but I don't want to hear the cost of all the other plants.

Q. What would be the cost on the basis of operation on peak load, or without peak load, at the Radford project, if operated?

A. The Radford project if operated without peaking would have a limit on reliable output capacity of around 16,000 KW. That figure divided into the $12,000,000 estimated cost would show the cost per KW to be $750.00, a figure approximately four times as much as the limit I mentioned. This is a crude illustration, and intended so, to be simple, because one may quarrel with my figure of $200.00 but, in my opinion no one could attempt to justify a plant costing $750.00 per KW. I might also illustrate

on a basis of the annual cost; If your fixed charges are
1884 estimated at 9%, operation and maintenance cost at $.80 per KW the total annual cost of operation would be $1,140,000. On this basis, and assuming a capacity value of $11.00 per KW year the annual profit from the operation of the Radford plant using it as a peaking plant with a dependable capacity of 75,000 KW would be $105,000 per year. On the other hand, if it were used as a base-load plant, producing a dependable capacity, or with a dependable capacity of around 16,000 KW, the annual deficit would be $640,000 per year.

Now a more rigorous demonstration and proof could be made, but I think these simple examples ought to be enough.

A. In my opinion it would be extremely absurd to operate the Radford project in any other way than as a peaking plant to supply the variable peak load demands of the power system to which it would be connected.

By Mr. JACKSON. I move to strike out the last answer as not responsive to any question pending, but a volunteered argument of the witness.

By the COURT. Let it stay in.

By Mr. JACKSON. Exception.

By Mr. THOMPSON:

Q. I hand you, marked for identification Government Exhibit 226, purporting to be a chart with this legend in the lower right hand corner: "Study showing operation of Radford with stream flow conditions as of the week ending Sunday, November 2, 1930, based on load curve, shape proportional to system load reported by Appalachian Electric Power Company for week ending November 3, 1935," and will ask you what that is?

1885 A. This is a chart and represents a study showing operation of a typical week of the Appalachian Electric Power Company after the completion of the Radford project. The load curve shape is taken by proportion from the weekly load curve reported by the Company for week ending November 3rd, 1935, the stream flow year is assumed similar to 1932, which was taken as a fairly representative average year. The system operation was assumed as shown on the exhibit with the upper portion of the peak carried by Byllesby, Buck and Reusens hydroelectric plants.

Q. That is in cross-hatching?

A. That is shown on the diagram by cross-hatching. These plants were deemed particularly suited to carry top peak because of their limited storage.

Q. Who prepared this chart?

A. This diagram was prepared under my direction.

(Exhibit 226 offered in evidence.)

Q. Will you now please describe this chart?

A. The solid white area shown in the so-called subpeak position represents the position that would be assigned to the Radford plant with its large storage capacity and facility for flexible operation.

The base of the load shown unmarked under the curve would be carried by steam plants of the company, and the London and Marmet hydroelectric plants which have no dependable peaking facilities, and also filled-in where available by coal saving kilowatt-hour production from the Byllesby, Buck and Reusens plant, using water, which they were not built to conserve for peaking operations.

Q. What does the Buck, Byllesby and Reusens plant show as to output, as to kilowatts?

A. The top 35,000 KW peak is shown carried by the Byllesby, Buck and Reusens plants with a week's output of 363,000 kw. hours an additional 2½ million kw. hours are available at these plants, which are not available for peak carrying purposes 1886. because of limited poundage facilities at those plants and would be used as coal saving kw. hours down on the base load of the system.

The diagram shows Radford starting up on Monday, Tuesday, Wednesday, Thursday and Friday, at 7 a. m. carrying its full load within an hour or almost immediately, carrying a full load at 8 a. m., then carrying practically a full load, 75,000 kw. to 3 p. m., the load then falling off so that at 10 p. m., the plant is closed down. The power output of Radford on this diagram, therefore, for the five days a week, shows up as a trapezoid approaching a rectangle in shape.

It is noted that on Saturday and Sunday the Radford plant would not be operated. These power blocks produced by peak load operation at Radford plant——

Q. Just tell what those are, I mean those power blocks, just describe them?

A. These blocks represent on this diagram, power output of plant. They also show water release by Radford plant. For instance, the vertical height of the block, 75,000 kw., also represents 9,000 second-feet of water flowing out of the plant, the interval between blocks represents a shut-down or no water flowing out of the plant.

The horizontal line, each week day, with an average length of 11 hours, represents a power wave 38 miles long leaving the plant. The interval of 13 hours between blocks, represents an interval, or a river dry of Radford stream flow of 50 miles between waves. The 57 hour shut down from Friday afternoon to Monday morn-

ing, represents an interval of approximately 150 miles of New River dry of flow from Radford power plant.

Q. How would those waves, following this chart, compare in their persistency in going downstream with the waves made by Buck and Byllesby in the test of 1930?

A. They would be very much more powerful and persistent.

1887 Q. Now I hand you, marked for identification, Govt. Exhibit 227, with the legend in the right hand corner, Appalachian Electric Power Company, wave study, New and Kanawha Rivers, March 30, and will ask you if you can identify it and tell us what it is?

A. This is a set of graphs or curves showing power waves generated during 1930 wave study on the New River.

Q. How many waves are there?

A. Approximately 18 waves.

Q. I hand you also marked for identification 228 (Govt. Exhibit 143 plus lines) with the legend down in the right hand corner, "New River and Kanawha River Power Waves."

By Mr. JACKSON. I notice that the vertical lines are not on this exhibit, or on the copy which you hand to us.

By Mr. THOMPSON:

Q. On Govt. Exhibit 227 I show you some dark vertical lines and will ask you if you know who put them on there?

A. Those lines were added by myself and they are intended to point out and mark the travel of particular power waves 4 and 10 in the tests of 1930. The same lines continue through Govt. Exhibit (228) 143, as used here.

By Mr. JACKSON. I think you had better let the designation Exhibit 228 stay in.

By Mr. THOMPSON. All right, change the second one to 228 instead of 143.

(Exhibit 227, being identical with Exhibit 513 marked for identification, and Exhibit 228 were offered in evidence.)

By Mr. THOMPSON:

Q. Now please have reference to Exhibits 227 and 228 and trace the waves therein shown on these charts, down the river.

A. These waves were generated at the Buck and Byllesby power plants on March 15th and on March 21, 1930, being two typical ones of a series of 18 waves, made during those tests.

Wave #4, to which I have reference, first arrived at Radford Dam Site on March 15–16 with amplitude of 4,700 second-
1888 feet and volume of 3,000 acre-feet, fluctuation on the Radford gauge was 2.0 feet.

This wave was traced down the river, arriving at Hinton on March 16–17, at Lock 2 on the Kanawha River, March 17–18.

I would like to say right here that it is necessary to use two grams here because they are drawn on two different scales.

89 Lock #2 is shown at the foot of exhibit 227, and is repeated at the top of Exhibit 228. The heavy black line ces down the trough preceding wave #4.

This wave was traced down the river as shown, amplitude at ck 2 being 2,800 second-feet, and the volume still approximately 00 acre-feet, showing the persistence from Radford dam site to ck #2 of 60 percent in amplitude and 100 percent in volume, ctuation on the Lock #2 gauge 0.6 feet. This same wave was ced down Kanawha River through Locks 4, 5, and 6, reaching ck 6 on March 17–18, with gauge fluctuation of 0.3 feet. This ve also causesd fluctuation on the gauge at Lock 9 of 0.5 feet, ck #9 being 72 miles from Kanawha River, and only 25 miles m the Ohio River.

Referring to Wave 10. This was originated at same power ant, travelled in a similar manner down river, its passage being rked.

Q. Are you talking about Exhibit 227 now?

A. I am talking about Power Wave #10 which is shown on vt. Exhibit 227 traveling down to Lock #2.

Q. How is it shown?

A. By a heavy black line.

By Mr. JACKSON:

Q. You are pointing to the second one on the right?

A. Yes, also shown on Govt. Exhibit 228.

Q. When you say that, you refer to the third black line to the ght?

A. The third black line to the right, starting at Lock 2 and ced down the Kanawha River to Lock #9.

This wave was steeper than #4, at its point of origin and was orter; that is, the same available pondage was used to produce higher wave of a shorter duration.

At the Radford dam site the amplitude was 6,400 cubic feet per ond and the volume 3,200 acre-feet, fluctuation in gauge heights, 2.4 feet.

90 Q. Are you talking now about the wave next in point of time, I mean the one to the left or the one to the right of black line you have identified?

A. I am pointing to Power Wave 10, which is the power wave t to the right or next following in point of time the black e referred to.

Q. That means to the right of the black line mentioned?

A. Yes, sir.

Q. Your last statement was in reference to situation at Lock #2?

A. Amplitude was 6,400 second-feet at Radford dam site, volume was 3,200 acre-feet, and the fluctuation in gauge height, 2.4 feet. At Lock #2 on the Kanawha River, amplitude was 3,000 second-feet, volume 2,800 acre-feet, and fluctuation on the gauge height was 0.6 feet.

This wave was observed down Kanawha River, through Locks 4, 5, 6, 7, and 9, the observed fluctuation in gauge height amounting to 1.0 feet on Lock #7, and 0.3 feet at Lock #9.

This wave appeared at Lock #9 on March 23rd, having been two days en route from the dam site. The persistence of this wave from Radford to Lock 2 was 50 percent in amplitude and 90 percent in volume.

Q. What is the significance of these experiments of 1930, from the Buck and Byllesby reservoirs in relation to the possible effect upon navigation in the Kanawha River by power waves produced at Radford plant, if operated on peak load, without reference to navigation and for the most successful and economical operation in the interest of the company?

By Mr. JACKSON. I object to the question insofar as it calls for this witness to express any opinion as to the effect on navigation in Kanawha River, also because he is not competent to testify on that subject.

By the COURT. I thought the question related to the plant below without reference to navigation.

By Mr. THOMPSON. Without reference by the company to the effect on navigation.

By Mr. JACKSON. My point is this. I have no objection to the witness being asked what he thinks would be the relation between persistence of waves that were produced by some assumed operation, and the relation shown by the 1930 experiment, but when there is an attempt to drag in the effect on navigation on the Kanawha River, I think it is improper, because the witness is wholly incompetent to express an opinion on the question of navigation, and I object to the question on that ground.

By the COURT. I think he may answer it, and will overrule your objection.

Defendant excepts.

By Mr. THOMPSON:

Q. Answer the question.

A. It is altogether logical to assume that the Radford project, if built, without the imposition of Federal requirements for coordination with other river users would be operated solely in the interest of its owners, and——

By Mr. JACKSON. One moment. I move to strike out the answer as not responsive to the question and as an attempt to invade the province of the Court. He is giving an assumption, and he is not competent to testify as to that.

Objection overruled. Defendant excepts.

1891 A. Power waves that would be created at Radford having an amplitude of 9,000 second-feet, and a volume of 3,000 acre-feet, released with a duration of 11 hours out of each 24, appear to me to be at least three times as powerful as waves that are shown in these tests. The persistence of such power waves expressed as a percentage of the Radford wave, should also be much greater in proportion, for the reason that the test waves were both lower in amplitude and shorter in duration than waves which I would expect from the Radford power plant on peak operation. The 57 hour shut down for week-end at Radford would drain the entire New River down to the London pool of the flow from above Radford and would permit passage on the following Monday of Power waves with very little reduction in amplitude or volume.

Now considering the Kanawha River, as it was improved prior to the construction of the London and Marmet dams, I would expect waves with fluctuation of 1½ to 2 feet at Lock 2, and 1 to 1½ feet as far down Kanawha River as Locks 7 and 9.

By Mr. JACKSON:

Q. When you refer to Lock #2 are you referring to London dam?

A. I said considering Kanawha River as it was improved prior to the construction of the London and Marmet dams. Considering the present set-up, of roller dams and power plants, I would expect a typical power wave, as I have previously described, from Radford, to arrive at the London pool with amplitude of about 7,000 second-feet and volume of about 7,500 acre-feet. The water surface at the London dam could be held fairly uniform by continuous and careful manipulation of the roller gate or power plant or both. The head water in the London pool would fluctuate, and the head water in the Marmet pool, below the London dam would fluctuate, I estimate, 1.2 feet or more; similarly the head water in the Winfield pool just below Marmet dam would fluctuate approximately 1.9 feet or more.

1892 The power wave described would travel relatively unimpeded through London, Marmet and Winfield pools out into the Ohio River.

The pool levels at these respective dams, could be held relatively constant by continuous manipulation of roller gates and power plants. However, the fluctuations occurring in the upper

ends of the pools below the dam, together with the resulting currents set up in the navigation channels would be very much more severe than any yet experienced, which have already been the cause of considerable complaint.

By Mr. JACKSON. I move to strike out the answer of this witness in regard to what would be the effect of his assumption on navigation in these pools and upon currents, and the further statement that they would be greater than currents already set up, and also his expression "which have already been the cause of considerable complaint," first, because he is not competent to testify on the subject, and second, it is hearsay.

Objection overruled. Defendant excepts.

By Mr. THOMPSON:

Q. I hand you, marked for identification, Govt. Exhibit 229, entitled "automatic gauge records, London and Marmet, June 15–19–1936," and will ask you what that is?

A. This is a chart taken from the automatic gauge records at London, and Marmet, June 15–19, this year, 1936, showing fluctuations in the London, Marmet and Dam #6 pools, resulting there from the withdrawal of approximately 1,800 acre-feet of water at a rate of 3,600 cubic feet per second from the London pool on June 19th.

Q. Where did you get this chart, marked for identification, Govt. Exhibit 229?

A. This chart was prepared under my direction, and constitutes a direct tracing of the automatic gauge records from the Government gauges at Marmet and the London dams.

(Exhibit 229 offered in evidence.)

A. The upper curve on the chart shows withdrawal of 1,800 acre-feet of water, from the London pool during a period of six hours, at the rate of approximately 3,600 cubic feet per second. It will be noted on the solid line on the middle diagram of the chart, that when these started the withdrawal of this amount of water, it caused the London lower gauge at the upper end of Marmet pool to bob up suddenly, to elevation 590.1, amounting to about 0.7 feet, then to oscillate rapidly down again, then up again, and finally when the power plant use or withdrawal
1893 of water was stopped, to drop below Marmet pool level to elevation 589.3 feet, total fluctuation of about 1.7 feet, following which the gauge rapidly bobbed up and down through a series of oscillations, finally coming to a period of steady pool level some six hours later, at elevation 590.1. The resulting apparent fluctuation in flow ran from 4,600 second-feet to 11,900 second-feet, back to 1,400 second-feet. These rates of flow are read from the rating curve for this station and are applicable to

the condition of steady flow and this apparently extreme variation in flow, I do not believe accurately represented true conditions as records of flow. However, the gauge records themselves attest the variation in gauge heights so that one is forced to conclude that the fluctuations in the gauge are even more violent than fluctuations in flow.

A. (Continuing.) Going down to the lower end, the lower Marmet gage below the Marmet power plant—let me go back—at the same time this fluctuation was going on at the head of the Marmet pool below the London plant, the Marmet pool elevation was being held somewhat closer to a constant level as shown by the short-dash line on the middle graph. Going down to the lower Marmet gage at the upper end of Dam No. 6 pool, below the Marmet power plant, similar large fluctuation in pool level, amounting to in this case about 1.7 feet, was observable below Marmet Dam in the upper end of No. 6 pool. This fluctuation, it will be noted from the chart, was rapid and severe. Now, these fluctuations illustrated here are those from the manipulation of the London pool and from the withdrawal of only 1,800 acre-feet of water, at the rate of 3,600 cubic feet per second, both of which quantities are much smaller than the quantities of flow that would be expected to rise in the London pool as the result of the peak load operation of the Radford power plant. The resulting fluctuations in gage heights, I expect, would be more severe than those here shown.

Q. Are you assuming a full London pool?

A. In the delivery of the power waves from the Radford
1894 Power plant into the London pool, I have assumed that the London pool would be held at a fairly uniform level at the dam gate. However, the capacity of the London pool to receive and store water and smooth out fluctuations from up river power plants is very small in comparison with the fluctuation in flow that may be expected from power waves from the Radford power plant; so, regardless of the operation of the London pool between the limits of 614 and 611, I would not expect the London pool to be able to operate with any marked degree of success as an after bay for the Appalachian Electric Power Company, even if such operation were attempted.

Q. I show you Exhibit 230, for identification, being apparently a photostat and profile of water surface June 16th, 1936. What is that?

A. This is a set of condensed profiles showing five stages in the manipulation of the London, Marmet and Dam 6 pools as these occurred on June 16th, 1936.

Q. Under whose direction was this made?

A. It was made under my direction from the automatic gage records illustrated on Government's Exhibit 229.

(Exhibit 230 offered in evidence.)

Q. Do you care to make any remarks in regard to the question of oscillation referred to there.

A. I would like to describe the chart.

Q. All right.

A. The chart shows in a more direct fashion the fluctuations in pool line given by the automatic gage records previously described.

The first profile shows the condition of steady flow at seven A. M., June 16th, 1936. The water surface in London pool is near normal. The water is flowing through Marmet pool—a small flow at slight slope. The same water is leaving Marmet Dam and flowing through No. 6 pool.

1895 The next profile, reading down the chart, shows the condition after the withdrawal of water from the London pool has started. The London pool has been drawn down .4 of a foot. The slope of Marmet pool is built up as shown. The flow of water from Marmet pool has increased by 3,600 cubic feet per second being withdrawn from London. The slope of No. 6 pool is also built up by the discharge of this water through Marmet power plant, and it is flowing away through Dam No. 6 pool.

The third profile shows the condition or conditions just before the end of the power draft at one P.M. the same day. The London pool has been drawn down. The water surface slope of Marmet pool is still being maintained and the lower Marmet gage still shows the water flowing away through No. 6 pool.

The fourth profile shows London pool drawn down and the withdrawal of water from that pool stopped. The water continuing to flow through the Marmet pool, however, has drawn the London gage below horizontal, the water flowing uphill from London to Marmet for the time being.

Q. What is that due to—the water flowing uphill?

A. An inertia effect. The introduction of water into the Marmet pool is suddenly stopped and the water flowing from Marmet has not yet stopped. The result is that the water flowing is being supplied from the storage in the upper end of Marmet, and, until the stored energy contained in the flowing water in the Marmet pool has been used up, Marmet pool will flow uphill from London to Marmet Dam.

The last diagram, No. 5, at the bottom of the exhibit shows a condition of steady flow resumed at eight P.M., with the London pool drawn down and practically no slope in the Marmet pool. The gage height in pool No. 6—of Dam No. 6 pool has fallen to near its original position.

Q. Assuming the Bluestone project completed and operating and the Radford project completed and in operation, had the Radford project operated on peak loads, state whether or not the
1896 Bluestone will absorb all of the waves that would be made by the operation of the Radford project on peak loads?

A. During portions of some years, when the Bluestone normal pool was full, there would be free water released from the spillway of the Bluestone Dam, and under conditions, power waves from Radford received in the Bluestone pool would be propagated of travel through the Bluestone pool over the spillway and on down the river.

Cross-examination by Mr. JACKSON:

Q. In your opinion, power waves from the Radford project would flow through the Bluestone reservoir, assuming its construction and operation—at what rate of flow in second-feet?

A. At what point?

Q. You just answered a question about it, and you ought to know the conditions.

A. What point on the river do you refer to?

Q. I should suppose at the Bluestone reservoir. Maybe you have a different idea about it?

A. When you say "Bluestone reservoir," do you mean above or below, in or out of Bluestone?

Q. You are talking about flowing over the dam.

A. I mentioned the flow over the dam.

Q. At what flow in second-feet do you think they would be wasting water over the dam at Bluestone?

A. I cannot say because the plans for the Bluestone Dam are still being—they are still in a preliminary state, and I have no way of knowing.

Q. Did that give you any difficulty in expressing your other opinion?

A. What other opinion was this?

1897 Q. On what would be the flow through there?

A. No, sir, it did not.

Q. Didn't you study Exhibit 145 and didn't that provide for a maximum hydraulic discharge of 11,000 second-feet?

A. What is Exhibit 145?

Q. That is the Bluestone report?

A. Yes, sir, that is correct. I have looked at it.

Q. If that is true, how much would the flow of second-feet have to be at Bluestone Dam, after it is built, to waste water over the dam?

A. That depends entirely on—it depends on many other things as to the operation of the Bluestone power plant.

Q. You know nothing about that?

A. No, sir, I do not.

Q. Assuming that Bluestone was operated so as not to waste water, it would utilize all the flow of water up to 11,000 second-feet, wouldn't it?

A. That is correct, but in my first answer, respecting which you are questioning me, I stated that, under some conditions. As has been brought out, the plans concerning the Bluestone plant are not fully matured, and I do not deem it material to know exactly what the conditions, or all the conditions, concerning these discharges to Bluestone would be. I think it is sufficient to know, from my general experience as an engineer, that there would be some periods, or some years, when the water level would be at the normal pool level and some small amount of water would be discharged over the spillway or dam at Bluestone. It is not necessary, in answering your question regarding the production of power waves, to know what conjunction of circumstances will bring it about.

Q. Isn't it a fact that, if the Bluestone project is operated so as not to waste water unnecessarily, the only time there could be any possible flow of a wave through the Bluestone reservoir, would be upon the coincidental conditions that the reser-
1898 voir was full and that the flow of the river at the Bluestone Dam site exceeded 11,000 second-feet?

A. No, sir.

Q. If it was operated so as not to waste any water?

A. Without going through a hydraulic study of operations of the Bluestone reservoir, which I submit is not practical, in view of the things we do not know, I will say that there may be conditions when the river flow into the Bluestone might be less than 11,000 and still be water above the spillway and waste over the dam.

Q. Why is that—how would that happen?

A. I don't think it is necessary to state that.

Q. I am not asking you if it is necessary, but I am asking you if you can explain that.

A. You would like for me to explain one possible condition that might cause that to happen? There might be any number of conditions to cause it.

Q. Can you give us one, just for a starter.

A. All right. That is what I asked you. Following a period of abundant river flow, there would be a time when the pool level at Bluestone would be above the spillway crest, and during that time, power waves propagated from Radford would go over the dam.

Q. Would these power waves that you talk about from Radford be less than 11,000 second-feet?

A. They would; they would be 9,000 second-feet.

Q. Now, according to page 115, of Government's Exhibit 145, it says [reading]: "A rule of operation was assumed as follows: Full wheel capacity, approximately 11,000 cubic feet per second to be used at times when water was wasting. At other times 10,000 cubic feet per second to be used to draw the pool down five feet, the top five feet of the reservoir being reserved for the reception of freshets."

1899 A. What page is that?

Q. It is page 115. Doesn't that show that it would be drawn down at the rate of 11,000 second-feet being in excess of the Radford hydraulic capacity, until they had drawn down five feet?

A. It states in this report that a rule of operation was assumed. As you know, having read many of these reports, and as I know from having written several of them, it is a preliminary tentative assumption made for some specific purpose.

Q. Accept that assumption in answering the question.

A. That is a brand new question. Literally, following this rule of operation, a power wave from Radford would be carried over the spillway only during relatively brief times before the withdrawal of 11,000 feet per second through the power units brought the water level below the fixed crest of the spillway. However, there is a fairly approximate assumption that we imply in this rule of operation. I don't know to what load the power plant at Bluestone, which is not yet completed, will be attached. That is not yet planned.

Q. I only asked you to assume what is in the reports. I did not ask you to accept the responsibility for the report.

A. Very well. Making the assumption that this rule of operation, which was gotten up, I anticipate, for another purpose, my answer would be as stated.

Q. Mr. Gerdes, will you tell me how the Radford plant would happen to be peaking while there is 9,000 second-feet of flow in the river?

A. I didn't say that.

Q. You were talking about power waves coming to the Bluestone reservoir and in a size that Bluestone could not handle. Tell me whether or not there would be any peaking at Radford, with the flow of the river 9,000 second-feet or better?

1900 A. There most certainly could.

Q. Would there be?

A. Yes, there would.

Q. You think they would be wasting water at Radford?

A. No, sir.

Q. You think that they would be passing it out without using it?

A. Where?

Q. At Radford?

A. No, sir.

Q. Why do you think they would be wasting any water if the flow was 9,000 second-feet at Radford?

A. I don't think so.

Q. What do you think they would do with it?

A. Where?

Q. At Radford?

A. They would be using it.

Q. Running it through the turbines?

A. Yes, sir. You understand, of course, that these 9,000 second-feet at Bluestone may come from other places than Radford very readily.

Q. What proportion of the year would the inflow into Bluestone at 11,000 second-feet obtain?

A. I don't know.

Q. Do you think it would be one-half of one percent?

A. I don't know that either.

Q. Of course, as soon as there has been any drawdown at the Bluestone reservoir, its capacity to absorb incoming waves would be far in excess of any wave that Radford could produce, wouldn't it?

A. As soon as there was a substantial drawdown, yes, sir.

Q. As soon as there was a draw-down of more than a few inches, that would be true, wouldn't it?

1901 A. I don't know how much a few inches in the Bluestone pond is.

Q. You don't even know the surface areas of the Bluestone—what they are?

A. I could look it up.

Q. You were interested in it enough so that you could testify to it on direct examination?

A. I keep figures in my head on ratio and proportion. I leave statistics in the books; there are reports that can be referred to for that.

Q. You have offered in evidence this morning certain exhibits, which I understand you say embody a part of certain studies that you have made.

A. To which exhibits do you refer?

Q. All of them that were offered?

A. That is right. If you will make your question read to all or some; I don't know what you are driving at.

Q. You don't have to know that. Now, this is the third time that you have testified in this case, isn't it?

A. Yes, sir.

Q. And you have made all of these studies since the last time you were on the stand, have you?

A. No, sir.

Q. You have made the greater part of them since then, have you not?

A. I have made a considerable amount since then.

Q. To be perfectly frank, you have done most of it for the matters you testified about this morning, since you were last on the stand, haven't you?

A. I have referred to a good many loose ends and correlated them to make a complete picture of it.

Q. Did you ever operate a large electric power generating distribution system?

A. No, sir, I have not, but I have made what might be
1902 termed critical studies of operations such as would lead to the supervision and modification and the criticizing of these operations.

Q. Now, Mr. Gerdes, you have testified in considerable detail about the plants of the Appalachian Electric Power Company's system. Do you know how much swing a steam plant of the Appalachian Electric Power Company will take?

A. Define "swing."

Q. In load.

A. By swing, do you mean installed capacity?

Q. How much variation in load will they take?

A. They will take a variation in load from zero to their installed capacity.

Q. That is as much as you know about a plant taking a swing in the practical operation of a utility?

A. Your question is indefinite.

Q. If you don't understand the terminology, I will pass it by.

A. The word "swing" is employed in several ways in conversation. You might define what you mean by "swing."

By Mr. JACKSON:

Q. What do you mean by the question as to how much swing a steam plant will take in operation?

A. Do you refer to peak load operation of steam plants? Swing is employed in several senses—there is a swing peak and a swing of load from one plant to another.

Q. Do you know what it means to estimate or state or determine how much swing a group of steam plants operating together will take?

A. Frankly, Mr. Jackson, I don't think you understand the question or the word, or you would not employ it in the sense that you do or appear to do.

Q. Do you understand it?

1903 A. I can read at least two meanings into your question.

Q. I don't doubt that. I wondered if you could answer the ordinary accepted meaning of a swing in a group of steam plants, which may be operating in a system.

A. I will state, as you don't appear to understand the question—a swing is a term employed in conversation among utility operating engineers, and one man may say it was one meaning and another another; and unless one has been associated with a particular group, he might not know the exact meaning.

Q. Now that we have had the benefit of your criticism, will you define both meanings.

A. Any two possible meanings where it might be used?

Q. Yes.

A. A swing peak—would be the maximum instantaneous peak load recorded on the integrating meter, covering or registering all of the demand upon the system of the power company. That is, the instantaneous maximum peak load recorded and known as the swing back. That is used for comparison with the hourly peak, the half-hourly peak, and the sixty minute integrated peak, and so forth.

meter?

Q. You said integrating meter—don't you mean indicating meter?

A. No, sir. I used that word in regard to the summation of the totals of several meters.

Q. What meter would illustrate that for a system?

A. That is another rather loose question. It might be an indicating or recording watt meter.

Q. Would you have one for each station?

A. Yes, sir.

Q. Where is the one that does it for the system?

A. Uusually in the load dispatcher's office. All systems don't have them, but the better run systems do. I am sorry that you are not familiar with it.

1904 Q. Do you know where the Appalachian Electric Power Company has its meter of the kind ou describe?

A. I don't know that they have any.

Q. Mr. Gerdes, I want to direct your attention to Exhibit 226 for a moment.

A. Yes, sir; what is that?

Q. They [indicating opposing counsel] will hand it to you. On this Exhibit 226, you have undertaken to show one method of operation during low water, as I understand it. Is that right?

A. I have undertaken to show one method of operation during non-flood season, this method being selected from my knowledge and experience, as being the one most likely to be used by the Appalachian Electric Power Company.

Q. But, of course, you realize that variations in method of operation to be used are almost infinite.

A. I realize that it is physically possible to operate a plant in infinite number of ways. I also realize that the Appalachian Electric Power Company must operate the plant in a manner essentially similar to the manner that I described, if it is to earn anything on the investment in the plant.

Q. You show on Exhibit 226 the method of operation for Radford, which would be essentially subpeak?

A. That is a term that you displayed here and I thought it was defined——

Q. You accepted that definition, did you?

A. Yes, sir.

Q. And used it in the construction of Exhibit 226?

A. Yes, sir.

Q. And you used it and that is what you mean and what you meant in your direct testimony when you referred to sub-peak?

A. Yes, sir.

Q. I show you, for instance, on Tuesday a peak on October
1905 25th of 407,000 kilowatts. You know on that day that the peak of the Appalachian Electric Power Company was nowhere near that, don't you?

A. What year are you talking about?

Q. The year that you are talking about, I assume.

A. The year that the Radford plant is completed and the load that the Appalachian Electric Power Company has grown to the point where it could be usefully employed.

Q. Then this has reference—some reference to October 30, 1932, but your chart has no relation to the kilowatt load of the Appalachian Electric Power system June 30th, 1932.

A. Where does it say 1932?

Q. In the lower corner of your chart. Perhaps I should say it has no relation to the load as of November 3rd, 1935.

A. What do you mean—would you mind going back?

Q. Your chart, Government exhibit for identification 226, does portion from the acutal load oft he Appalachian Electric Power Company system for the week ending November 3, 1935?

A. No, sir. It follows the load I anticipate the Appalachian Electric Power Company will have shortly after the completion of the Radford power plant. This load is estimated by direct proportion from the acoual load of the Appalachian Electric Power Company for the week ending November 3, 1935, each hours out-

put being increased in direct proportion. The shape of the 1935 load curve embodies the characteristics in the load which can reasonably be expected to remain substantially unaltered and which are used here in the illustration.

Q. Your Exhibit No. 226 shows a hypothetical method of operation for a plant not constructed for a hypothetical load that does not exist and never has existed in the history of the Appalachian Electric Power Company?

A. That is correct. However, the hypothetical load and
1906 other hypotheses you mentioned, are derived from careful study, and may I say, experienced judgment, and employing the same methods which, in my opinion, the engineers of the Appalachian Electric Power Company would employ, studying the same question. In my opinion, it is the best data available, and the Appalachian Power Company is presumably willing, and I will say it is willing so far to expend $12,000,000 on the Radford plant, upon the results of similar studies made by its own engineers.

Q. Am I right in thinking that if you lengthen the horizontal scale on this exhibit 226, it would make these peaks look different in shape?

A. They would look different in the picture. They would answer to the same description.

Q. They would answer to the figures they assume?

A. Yes, sir.

Q. But the picture shown by the graph would be a much flatter and longer peak curve, wouldn't it?

A. It would appear so in the illustration. However, this shape diagram is one commonly employed by power companies and commissions in representing this sort of data.

Q. As I understand, you say the hatched portions of the tops of the peaks, is the amount of the peaks supplied by Buck and Billesby?

A. Yes, sir.

Q. And Reusens?

A. Yes, sir.

Q. That is on your hypothetical operation?

A. Yes, sir.

Q. Will you look at your peak operation for Monday, October 24, and peak operation Tuesday, October 25, and tell me what is the relation between the amount of peak supplied by these three plants, Buck, Byllesby and Reusens, for these two successive days?

1907 A. On Tuesday, these three plants are shown as carrying their full reliable minimum capacity; on Monday they are carrying similar capacity except——

Q. What actual ratio was the capacity you show them carrying Monday and Tuesday?

A. About 3 to 1.

Q. You show them carrying three times as much on Tuesday as on Monday?

A. Yes, sir.

Q. Why is that?

A. Why that is shown in the fashion it is to simplify the diagram, and make it easier to understand.

Q. That is the point; why did you——

A. Let me finish.

Q. All right.

A. The additional power during this week there—an additional 2½ million kilowatt-hours shown were used at other hours, as shown by the note at the top of the exhibit. That power block might have been shown on Monday, below and to the right of the Radford portion of the diagram—that is, between 250 and 300,000 kilowatts and between 12 noon Monday and ~~10 P.~~ M. Monday. You understand all power plants on the system are operating simultaneously and one is shown on top of the diagram, as a matter of convenience and ease of understanding and portrayal.

Q. The hatched blocks show the amount of power supplied by the plant for peak purposes?

A. Yes, sir.

Q. And they vary as to size?

A. Yes, sir.

Q. I direct your attention to Exhibit 227 and 228. You gave that amplitude of Wave 4 at Lock 2, in second-feet, didn't you?

1908 A. I believe I did.

Q. You can refer to your notes that you used and find it very readily?

A. That is right.

Q. What is it?

A. I believe I said 2,800 second-feet.

Q. How did you arrive at that figure?

A. That was calculated from—not calculated—read off from the respective upper and lower gage heights in the wave shown on Exhibit 227 or 228, I don't remember which. Look at 228, it is a better scale and I suppose I used that.

Q. You read it from the gage heights?

A. Yes, sir; there is a rating curve at Lock 2 and the lower gage has a flow corresponding with it, and this flow difference is the amplitude on the second day.

Q. You took some rating curve and applied it?

A. Yes, sir; the one used by the United States Engineers, I think.

Q. Do you know that?

A. I can refer to the curve.

Q. Don't you know what curve you used?

A. I did not make it; I used it.

Q. Which one did you use, do you know?

A. Yes, sir.

Q. Was it the one of the Army Engineers?

A. May I have that rating curve.

Q. How did you measure the amplitude of Wave 4, at Lock 2, from what base?

A. If you will permit me, I will refer to my notes.

Q. Can you tell me about what base you used?

A. Yes, sir; just a second. Why that was, the amplitude was measured from the crest—between the crest of the average and the preceding and succeeding troughs.

Q. What is your amplitude for Wave 10, Lock 2, on that same basis.

1909 A. 3,000 second-feet.

By Mr. JACKSON:

Q. Mr. Gerdes, you testified in your direct that the Radford project, without peaking, would have a capacity of 16,000 k. w.?

A. Yes.

Q. In giving that figure, you gave the prime load carrying capacity without peaking?

A. That would be the prime load carrying capacity as estimated by me during the months of the system peak load, being in the fall, in the months of November and December.

Q. And that did not make any allowance for the capacity of the Radford project, or include any allowance for the capacity of the Radford project, to develop power in addition to prime load carrying capacity, as you have assumed that capacity?

A. I will refer to the calculation on that, if I may.

Q. Don't you remember?

A. My dear sir, I don't remember details of every calculation. You are referring to a detail.

Q. It is not a detail, but the principle of the method of calculation.

A. Do you mind repeating that question?

Q. Will you read the question, please?

A. I did make allowance for the power produced at the Radford project in excess of the prime load carrying capacity.

Q. Is your figure of 16,000 k. w. prime load carrying capacity as you assumed it, or not?

A. Do you mean did I assume what I said?

Q. Read the question, and I think you can understand it.

A. I don't think that makes sense.

Q. Under your assumption, did your figure of 16,000 k. w. represent prime load carrying capacity, or something else?

A. It represents prime load carrying capacity if Radford is operated as a base load plant.

1910 Q. And, therefore, it does not include any capacity which Radford may have to generate power in addition to its prime load carrying capacity?

A. It does.

Q. How much? What is your figure for prime load carrying capacity?

A. Expressed in what? Are you interested in dollars or kilowatts?

Q. Kilowatts.

A. 16,600 is the figure I have assumed as——

Q. Assumed as what?

A. I have assumed that if Radford is operated as a base load plant, it would utilize during an average year, during the months of November and December, a minimum average flow of 2,000 cubic feet per second—that is, operating the plant, taking the river and regulating it, but without peaking it.

Q. I understand.

A. If that flow is used at uniform rate through the Radford plant, it would permit the plant to assume responsibility for carrying 16,600 kilowatt of the system peak.

Q. And that, on your assumption, would have prime capacity, wouldn't it?

A. During that year, it would.

Q. There would be other times during the year when the flow would exceed 2,000 second-feet, and, without peaking, it would produce more than that, wouldn't it?

A. That is correct, but that would not be prime capacity?

Q. I didn't say it would, did I?

A. You appeared to imply that.

Q. Now, you said that, on your assumption of a complete cut-off of water at the Radford dam site over a period of 57 hours,

1911 the river would be drained of all flow for a considerable distance below the dam site before the release of your assumed wave on Monday, and that this would make your assumed wave on Monday go faster; is that right?

A. I did not say that.

Q. Well, repeat what you did say as to the effect of the stream bed being empty, or substantially empty, as you assumed upon

the rate of travel of the waves you assumed to be released at the Radford dam site?

A. I did not make the assumption which you have just stated.

Q. Well, did you say that if the flow was cut off at the Radford dam site for 57 hours over a weekend, it would leave the stream below the Radford dam site for a considerable distance empty of the flow coming from above Radford?

A. That is what I said.

Q. Did you say that that condition in the stream bed would increase the amplitude of the waves that you assumed to be released on the following Monday?

A. I did not say it would increase the amplitude of the waves.

Q. Well, what did you say? [Pause.] Do you remember?

A. Oh, yes, indeed.

Q. Please answer the question.

A. I am considering the answer.

Q. You know the answer, don't you?

A. Yes. Do you mind repeating the question? Your colloquy has gotten me off the point.

NOTE.—The testimony for some distance back was then read. Witness: You covered quite a bit of ground. Do you mean what did I say about what? I do not want to repeat all the testimony about the waves.

By Mr. JACKSON:

Q. Read the last two questions to the witness.

A. There is no use in going back over that. You asked did I say so and so, and as to one I said no, and as to one I said yes, and then you asked what did I say: What did I say as to what?

Q. Read the last questions the witness cannot understand.

NOTE.—The testimony was again read.

A. I still do not know what you are talking about. Would you like the reporter to read the question of this morning?

By Mr. JACKSON:

Q. Is that a fair, honest answer?

A. Yes.

Q. You are not able to comprehend that?

A. I am unable to——

Q. Let us start all over again, and see if I can get at what you do understand.

1912 A. You understand if I answer you I am speaking for the record, and I do not want to make a guess at it.

Q. You did testify that, on your assumption that the Radford flow was cut off for 57 hours over a weekend, the river below the Radford dam site would be left without any of the flow from

bove the Radford dam site remaining in the channel for a con-
derable distance?

A. That is correct.

Q. Now, I asked you whether or not you said that that condition
ould result in an increase in the amplitude of the waves which
ou assumed to be released at the Radford dam site on the follow-
ng Monday; you said you did not; is that right?

A. That is correct.

Q. Now, what did you saw would be the effect of this condition
ou assumed in the stream bed below Radford dam site after an
ssumed cut-off of 57 hours upon the amplitude of the wave as-
umed to be released on the following Monday at that dam site?

A. The fact that the flow at Radford was cut off for a period of
7 hours would entirely drain out of the river below, all the way
own to the London pool, the water that had been released from
adford the previous week, and would leave the river in substan-
ially the position of carrying the water only from the remainder
f its shed. Then, there being no trough or tail of the preceding
ave for it to impinge upon, the first wave released from the Rad-
ord plant on Monday would travel to the London pool and beyond
ith a greater effect than would the waves released during the
ntermediate days of the week.

Q. Well, when you say it would travel with greater effect, do
ou mean it would travel with greater amplitude?

A. It would reach the London pool with greater amplitude and
I believe volume.

913 Q. Do you mean also it would reach there more quickly?

A. I did not so say.

Q. Don't get nervous. I am just asking you.

Q. I am not nervous. Do you mean whether it would reach
here more quickly?

Q. In your opinion?

A. I don't say there would be any substantial difference in the
me of travel.

Q. What, in your opinion, is the effect, if any, of a relatively
ry stream bed upon a wave discharged or initiated upon such
stream bed in comparison with a wave discharged upon a sub-
tantial base flow, so far as dampening out is concerned?

A. A dry stream bed would have a relatively larger dampen-
ng and dissipating effect upon a power wave than a stream bed
ontaining a substantial flow. However, I have considered that
n my previous answer, and the fact would be that for the greater
ortion of this travel the Monday wave released from the Rad-
ord plant would be traveling not on a dry stream bed but on
stream bed containing a substantial flow of water.

Q. Mr. Gerdes, you expressed an opinion that there would be certain fluctuations in the London and Marmet pools as the result of the release of the power wave assumed by you at Radford; am I right in understanding that, in giving this testimony, you did not assume the use of the London pondage? [Pause.] Can you answer the question, Mr. Gerdes?

A. Oh, yes; indeed.

Q. Please do so.

A. My original estimate was predicated upon the assumption of a substantial uniform pool level at London, inasmuch as the pondage now being utilized there is being so used under a revokable permit. However, the pondage at London is so
1914 small in comparison with the volume of the power waves which may be expected from peak load operation of the Radford power plant, that in my opinion no substantial or material difference would result if the London pondage were utilized in an effort to check this power wave.

Q. Regardless of your opinion about that, you did testify that you were assuming that the London pool was held steady, didn't you?

A. Was held reasonably steady.

Q. And, regardless of what difference it would make, your testimony was, therefore, based upon the assumption that the London pool was not used for pondage, wasn't it?

A. My testimony was based upon my experience and opinion, as I have stated.

Q. Will you please read the question?

A. My testimony this morning was based upon that assumption. My testimony now is, as I have stated, it makes no substantial difference.

Q. I want to get the basis of your assumption.

A. My understanding is that a change in condition to affect a change in results must be material and important.

Q. Now, you testified in this connection, Mr. Gerdes, that, on your assumptions with reference to waves at Radford, under present conditions, there would be a fluctuation of 1.2 feet at the head waters of Marmet pool at the London dam; is that right?

A. I said there was approximately 1.2 feet.

Q. The figures you give there deal only with the upper end of the pool in question?

A. That is correct.

Q. At the foot of the dam above the particular pool?

A. That is correct.

Q. I now want to direct your attention a moment to your Exhibit #229. You testified that in part this was a tracing from the record of an automatic recording gage, I believe?

1915 A. You have reversed my statement. I believe I testified this is part of a record, all of this is part of a record of an automatic recording gage.

Q. It was traced from the record of an automatic recording gage?

A. That is correct.

Q. Are you testifying everything on Exhibit #229 was traced off the record of an automatic recording gage?

1916 A. No, sir, but the graphs of the water surface were traced from the automatic gage.

Q. By that you refer to the three solid lines running across the exhibit?

A. And one dash line.

Q. Now all of these figures that appear on the chart, were they placed there by you?

A. That is correct.

Q. Take your figure of 11,000 c. f. s. how did you get that?

A. That was read from the rating curve for the gage at the upper end of the Marmet pool.

Q. Is that your best judgment of the discharge at that point, at that time?

A. No, sir, it isn't.

Q. What did you put it there for?

A. To indicate what the rating curve showed.

Q. You knew if the rating curve were interpreted as showing that it was misleading, did you not?

A. It would be misleading without an explanation.

Q. It would be misleading if it was assumed to show a flow of 11,000 second-feet, would it not?

A. I testified fully as to that this morning.

Q. Why didn't you explain it on your chart?

A. Because I expected to testify regarding it.

Q. Will you give your explanation of why you put 11,000 second-feet there?

A. To show that the fluctuation is more severe than one would calculate in a power wave study, to show the actual fluctuation is more severe than one would calculate in a power wave study, as the one made here, and which I described—this exhibit indicates that when the water is placed in oscillation and goes freely

1917 up and down in the Marmet pool that just as described by Col. Watkins, the results are even more than expected from a calculation—that is something you would not want to testify to without seeing it.

Q. What rating curve did you take that from?

A. One introduced as an exhibit.

Q. Tell me which one, please.

A. This one—Government Exhibit #117-a, labeled "London lower pool with Marmet in place."

Q. One of the curves testified about by Mr. Winn and Mr. Teeter?

A. I believe it was one of them.

Q. Don't you know that curve even if it were accurate, could only be used when the lower end of the Marmet pool was at the stage of 590?

A. That is correct.

Q. And it wasn't at that stage when the reading on the gage occurred from which you undertook to apply the curve?

A. I will refer you to a chart here, it refers to the London pool at that level, at that time.

Q. Does it show it above it?

A. A matter of 1/10 of a foot, not material for this purpose.

Q. Now you have another item of zero c. f. s. where did you get that?

A. That is at the dip of the fluctuation that went downward, that is, if my right hand is at the London dam and my left hand at the Marmet dam, between them is the Marmet pool. When the water was flowing from London to Marmet it flowed from right to left, and when the water was cut off it oscillated in the Marmet pool once downward to the right, that is the place to which you referred, zero c. f. s., then upward again, and then downward again, and upward again, and downward again, and then upward, finally to a state of rest.

1918 Q. Now would you mind telling me how you got the zero c. f. s. flow?

A. That zero c. f. s. relates to the fact at that point the level of the Marmet pool at the London dam was below the crest of the London dam.

Q. Did you read that off of any rating curve?

A. No, sir.

Q. You just assumed that?

A. That is assumed from my judgment and experience.

Q. Just from your general experience?

A. There might have been a flow out of the London power house at that time. The zero c. f. s. is primarily put there to point out the fact that on the rating curve which is the condition for steady flow, that point represents an impossible condition.

Q. In fact, you don't know anything about the flow, but just put down zero anyway?

A. I put that down to point out the extreme oscillation of the Marmet pool.

Q. Did that have due regard to the flow in second feet to show the extent of oscillation?

A. Would you like me to describe the oscillation?

Q. I would just like for you to answer my question.

A. The engineer who plotted that curve, under my direction, pointed out this downward oscillation and said "this represents an impossible condition, what shall I do," and I said "call it nothing" and that is what we called it.

Q. That is the way you got the figures shown on Exhibit #229?

A. That points out that oscillation represents an impossible condition, for the state of steady flow in the Marmet pool.

Q. You have another figure, 1,400 second-feet, how did you get that?

A. That was derived from the same rating curve.

1919 Q. Plaintiff's Exhibit #117-a?

A. That is right.

Q. Referring to this so-called oscillation, you have been describing, and also to your Exhibit #230, at four o'clock in the afternoon of the 6th, you showed a dip of about 7/10 of a foot.

A. That is correct.

Q. That is below pool level?

A. That is correct.

Q. That would be inaccurate as a measurement of the dip below the pool surface that synchronized with that dip, would it not—look at your exhibit #229?

A. I wouldn't say it was inaccurate. I would say the 7/10 of a foot is measured from the normal pool elevation of the Marmet pool.

Q. And not the actual water surface that prevailed at that coincident time at the Marmet pool?

A. The Marmet pool at that time was in a state of oscillation, the summit of the oscillation may have been, and I wouldn't be surprised if it were, at some intermediate point in the pool between the London and Marmet dams; the automatic gage record at the Marmet dam shows that at that instant the water surface in the Marmet pool at the Marmet dam was some 2/10 of a foot below the normal pool level.

Q. Turn to your Exhibit #230, the fourth figure from the top, which is intended to represent this four o'clock oscillation, the middle column shows the Marmet pool or elevation of the dam is above normal elevation, instead of below, doesn't it?

A. Apparently so, it appears that to correspond with Exhibit #229 it should have been drawn to a point 2/10 of a foot lower.

Q. Should have been drawn more than 2/10, should it not?

1920 A. I should say 2/10.

Q. On your Exhibit #230 you have shown it above the normal elevation instead of below, haven't you? That is, the lower end of the Marmet pool.

A. Yes; it is a matter of some hundredths of a foot above, as shown on Exhibit #230, and without checking it, it appears it should have been drawn to a point 2/10 of a foot below the normal elevation of the Marmet pool, however, that is not material, or if material, I invite you to show in what way it is material.

Q. What was the rate of withdrawal from the London pool, as shown from your Exhibit #229?

A. Average 3,600 c. f. s.

Q. How did you find that out?

A. By taking the draw-down and applying the capacity of the London pool.

Q. What is the capacity of the London pool?

A. Approximately 900 acre-feet per foot.

Q. Can you tell me the area at elevation 614?

A. It is somewhere between 900 and 1,000 acres.

Q. Can you give me the areas for elevations 613, 612 and 611?

A. The area at 611 is in the vicinity between 800 and 900 acres.

Q. Don't you know what it is?

A. Not to a gnat's eyebrow. That is close enough for this purpose.

Q. That is your familiarity or as close as you have gone or close enough for your purposes for estimating the discharge?

A. Calculating the discharge.

Q. Now, Mr. Gerdes, what was the rate of change of inflow at the foot of the London dam?

1921 A. Into the London pool at the foot of the Marmet dam?

Q. Into the Marmet pool I said at the foot of the London dam?

A. If I understand your question correctly, the draft on the London pool indicates that the increase in flow through the London dam or power plant was 3,600 second-feet during the time I have described.

Q. Is that the rate of change of inflow into the Marmet pool?

A. I have made a valiant effort to answer your rather obscure question. I will have to ask you to redefine it.

Q. Will you tell me what was the rate of change, which involves time, doesn't it?

A. It would appear to.

Q. What was the rate of change in inflow into the head of the Marmet pool at the London dam?

A. Well if you wish to make your question more clear you might say between what times?

Q. Suppose you tell me what was the rate of change of the inflow into the Marmet pool below the London dam, which you assumed to cause the fluctuations shown on your Exhibit #229?

A. At what time?

Q. That would be the middle graph. Just before and around noon of the 16th of June, 1936.

A. The increase in flow through the London dam or power plant between approximately 8:00 A. M. and 2:00 P. M. on June 16, 1936, was approximately 3,600 second-feet. I thought I said that once before.

Q. What was the rate of change in inflow—what rate did the change in inflow increase per hour?

A. As far as can be determined from this graph it didn't increase at all, it started out with 3,600 and with one interruption around noon time, and then resumed shortly after twelve o'clock and kept it up until about two P. M. when it quit.

1922

Q. Do you know on the days covered by your chart Exhibit #229, what was the rate of change in discharge at the foot of the London dam and into the Marmet pool?

A. Your question is not clear.

Q. Do you understand what is meant by rate of change in inflow?

A. The varying rate of flow is what rate of change implies.

Q. Any variation in flow, that might be an increase of 500 second-feet per hour, or 1,000 second-feet per hour, might it not?

A. As shown by this curve, the rate of change as you just defined it, wasn't much. The figure I gave you of 3,600 second-feet is derived from this drawn-down curve, and it appears the rate of flow out of the London pool into the Marmet pool wasn't far from that during the entire period. By not far from that I mean if it did depart from it, it departed either not much in amount or if greatly in amount for a short time only.

By Mr. JACKSON:

Q. Would you look at your exhibit 229 and tell me whether or not if your figures were right for the forenoon on the 16th you would not show a rate of change of around 6,000 second-feet an hour, being the difference between your figures, 4,600 second-feet, before you show the upward curvature of the curve, and your figure of 11,000 second-feet at the top of the curve.

A. If your figures are right for before noon——

Q. You would not show a rate of change around 6,000 second-feet, or doesn't your chart, if your estimates of flow are right, show that in about an hour before noon on the 16th the increase in flow was around 6,000 second-feet?

A. The figures 4,600 second-feet and 11,000 second-feet, shown on the middle graph, Exhibit 229, indicate from a reading
1923 of the rating curve for the lower London gauge an apparent fluctuation of 5,400 cubic feet per second.

Q. 6,400, is it not?

A. That is right, 6,400 cubic feet per second whereas, the drop in the upper curve indicating draft from the London pool was computed to show approximately 3,600 c. f. s.

Q. Average throughout the period?

A. That is right.

Q. Now have you finished your answer?

A. Yes.

Q. Mr. Gerdes, are the fluctuations in the upper end of such pool a function of rate of change in the inflow and the rate of change in stage, or not?

A. By fluctuations do you refer to rapid fluctuations such as these?

Q. I refer to what you have been talking about as oscillation in the upper end of the pool.

A. If you refer to these fluctuations in the upper end of Marmet pool they are functions not only a change in flow, but also of the physical dimensions and contour of pool, its relation to length, to width, and its depth, in other words, to more simply express it, how freely the water will slosh around in the pool.

Q. I asked you whether or not these so-called oscillations are a function of the rate of change in the inflow, or not?

A. The oscillations themselves——

Q. Just tell me yes or no and I will accept your statement.

A. It is not one of those kind of questions. Oscillations are functions of the rate of change of inflow to the pool among other things, but there are numerous other factors which may affect them, perhaps more important than the one you have mentioned, but the one you have mentioned is one that affects them.

1924 Q. Are these oscillations also, in part, function of rate of change in stage at the head of the pool?

A. The rate of change in stage as well as the stage itself in this case appears to be caused, in part, by these oscillations.

Q. Read the question. [Question read.]

A. The last answer is still good.

Q. Will you state whether in your opinion these oscillations at the upper end of pool are, or are not, in part a function of the rate of change in stage at the upper end of pool?

A. If you want a literal answer, I would say no. If you want any explanation of it, I will say that the rate of change in stage is in part a function of the oscillation.

Q. As I understand it, these so-called oscillations or fluctuations in levels shown on Exhibit 229 were caused by operation of the power plant at London and Marmet?

A. I have no record here of operations of the Power Plant. They were caused presumably by operation of power plant but they may have been caused by manipulations at the dam.

Q. In any event they were caused by either manipulation of the power installation or the gate at the London and Marmet dams?

A. That is right.

Q. You testified that in your opinion the wave which you assumed would be produced by operation of the Radford project, would be worse than the wave shown in the 1930 test? Will you state briefly the basis of your assumption?

A. My conclusion was based upon my study of the 1930 waves, and the circumstances of the test and upon my knowledge and experience on river hydraulics.

Q. I am afraid I did not make myself clear. I was not wanting you to state what you assumed to be your qualification for your opinion, but I wanted you to state the fact that you assumed as a basis for the conclusion that the Radford wave, assumed by you would be worse than 1930 wave. I want to know what kind
1925 of a wave did you assume at Radford?

A. The wave I described in connection with my exhibit.

Q. Just tell me briefly about that?

A. The exhibit showing operation of Radford during typical week, Government Exhibit 226.

Q. Did you assume a wave with amplitude of 9,000 second-feet and duration of 11 hours?

A. That is correct.

Q. And volume of 8,000 acre-feet?

A. That is correct.

Q. That is, this was based upon your assumption that the Power Company would operate the Radford project so as to produce waves of those characteristics. Is that right?

A. That is correct.

Q. And you assumed that method of operation regardless of the season of the year or any other condition?

A. I did not.

Q. What variation did you make in your assumption of facts?

A. I made the study which is embodied in Exhibit No. 226, to show according to my best judgment, and from my experience and knowledge of the operation of public utility hydroelectric plants, in connection with the systems of those companies, what would be the best way viewed from the standpoint of the company, to operate the Radford Power Plant, and I have described that operation.

Q. The point I am getting at is regardless of why you assumed it, you did assume that the Radford plant would be operated so as to discharge waves with the characteristics stated by you a little while ago?

A. That is correct.

1926 Q. And that was the basis of your conclusion, that the effect of those waves, would, as you described it, be worse than the effect of waves in the 1930 wave test?

A. That is correct.

Q. And you assumed there were no considerations to deter the defendant from operating the Radford project in that way?

A. I may have misunderstood your last question. This method of operation shown on this typical low diagram, exhibit 226, I believe, I stated on my direct testimony, if not, if you wish I will state it now, that this represents typical operation during the greater part of the year. During flood season or during short periods when there was water available 24 hours a day, or substantially so, equal to the capacity of the Radford Power Plant, it would, of course, during these relatively brief periods operate in an auxiliary capacity of saving whatever fuel might be saved by utilizing this otherwise waste water.

By Mr. JACKSON. I move to strike out that statement of the witness and I will ask him to answer the question I asked, because I am sure he cannot remember it after making that long statement.

A. That were being produced, this 9,000 second-feet wave?

Q. Yes.

A. In my opinion——

Q. I am just asking you what you assumed, and not for your opinion.

A. I assumed and in my opinion there are no present considerations to deter the Appalachian Electric Power Company from operating the Radford project in that way.

Q. Now I want to direct your attentiton to Govt. Exhibit 228. Have you got it before you?

A. Yes.

Q. Does Exhibit 228 show all of the maneuvers of the movable dams?

A. I have not checked to see whether it shows all maneuvers, but I have checked it as to waves concerning which I testified.

1927 Q. You introduced the exhibit and don't you know whether it shows all movements of the movable dams, or not?

A. If you wish I will read the maneuvers of the movable dams at this time.

Q. I asked you if it shows all of them?
A. I don't know whether it does at this time.
Q. You don't know whether it does, or not, do you?
A. I don't recall at this time.
Q. You never did know, did you?
A. Yes; I think I did know.
Q. When did you know it?
A. Sometime in the past.
Q. When?
A. I did not record the dates.
Q. How did you find it out?
A. By reading the record of maneuvers.
Q. Where did you read the record?
A. In the report of the United States Engineer Department where they are kept.
Q. Where are they?
A. I think I have them right here. Would you care to have me read these maneuvers?
Q. No.
A. Then you are satisfied now, all right, I have here a copy of the record of the maneuvers to which you refer.
Q. Let me ask you this question, why does not your exhibit show all maneuvers of movable dams and why are some of them omitted?
A. I don't know whether any are omitted. If any are omitted it is because it was not pertinent or material to the purpose for which the exhibit was used.
Q. Will you produce the record of maneuvers?
A. Yes, sir; with pleasure.
Q. Just show them to me.
1928 A. Just wait over there and I will hand them to you.
Q. The sheet you have in your hand, is that the record?
A. If you don't mind, I will look at it to be sure of myself. (Witness examines record.) Yes, this is the record.
By Mr. JACKSON. The witness has produced a sheet of paper bearing at the top the title "maneuvers of dams on Kanawha River during wave test, 1930," and I will ask to have it marked Defendant's Exhibit 543 for identification.
(Exhibit 543 marked for identification.)
Q. This paper which the reporter has just marked Defendant's Exhibit 543 is a record of the movable dams during the test of 1930?
A. I understand it to be so.
Q. You got it from the official records of the Government, didn't you?
A. From the engineer's office.

By Mr. THOMPSON. If your Honor please, that is an officia document and we do not care to have it left here.

By the COURT. Is it a part of the original record?

By Mr. THOMPSON. The engineers tell me it is a part of th original record.

By the COURT. They are entitled to a copy of it, but I do no think the original record should be put in here. You had bette have typewritten copies made of it.

By Mr. THOMPSON. What is Your Honor's pleasure about it

By the COURT. I think that typewritten copies should be mad of it and left here.

By Mr. JACKSON. Mr: Gerdes, defendant's Exhibit 543 fo identification is a photostat, is it not?

A. If you will let me look at it, I may be able to tell you (Witness examines Exhibit 543.) Yes, this a photostat.

Q. Cannot you say now from your examination of Exhibit 54 for identification that the movements of the wicket dams are no all shown on your exhibit 228 or exhibit 143 either?

1929 A. I don't see why I should guess at it. If you will le me compare it, I might be able to tell you.

Q. Mr. Gerdes, did you from your examination of defendant' exhibit 543 for identification, determine whether exhibit 22 showed all manipulations of the wicket dams?

A. I have checked it and I find that not all of the manipula tions of the wickets during this period are shown on exhibit 228

Q. Only two are shown near the upper half and somewha to the right of center?

A. That is correct. However, I find, on a recheck there ar no manipulations which would have any material effec 1930 on power waves four and ten, which were the ones I wa chiefly interested in.

Q. Now, Mr. Gerdes, will you tell me what was the amplitud of wave #4 at Lock #9, in second-feet?

A. Did I give that? on my direct testimony?

Q. I am not sure.

A. All right, then I will check it. I did not give you th amplitude of Wave #4, at Lock #9.

Q. Can you do so?

A. No; not from the data I have at hand here.

Q. Can you give me the volume of wave at Lock #9?

A. Not at this moment.

Q. Was there any effect at Lock #9 from Wave #4?

A. There was.

Q. What was it?

A. Gauge fluctuations of .5 of a foot.

Q. Isn't that amplitude of the wave in feet?

A. It is in feet. I understood you to ask the cubic feet per second.

Q. I also asked for it in feet. You have in your hand what you said was an official report from the U. S. Engineer Office.

A. May I correct you. It was not an official report.

Q. At least a report.

A. No, sir; it was not a report.

Q. Was it a preliminary report?

A. No, sir; it was not a preliminary report.

Q. You did have a book from which you took out the record of the manipulation of the wicket dams, didn't you?

A. I did.

Q. And that was a book that you got from the engineer's office at Huntington?

A. That is correct.

1931 Q. Will you produce that?

By Mr. THOMPSON. If Your Honor please, I object to that. He is asking him now to bring him an interoffice document, and he knows it is an interoffice document, and I do not believe it has any place here before this Court.

A. It is not even an interoffice document, it is just a bundle of compilations.

By Mr. JACKSON. I think this data was introduced when Mr. Kramer was testifying, but let me ask him this question.

Q. Didn't you examine all of the data in the engineer's office dealing with this test of 1930?

A. I did not.

By Mr. JACKSON. Now, If Your Honor please, a moment ago the witness had this very book in his hand and pulled out a sheet, and counsel for the Government objected to our having a photostatic copy made of it on the ground that it was an official record. Now I think maybe I can simplify the matter a little bit by this procedure, and I do not want to take but a moment with it.

I have in my hand a volume, which on the outside bears the title "Report of power wave, New and Kanawha Rivers." On the first sheet it says "Preliminary report on power waves, New and Kanawha Rivers, U. S. Engineers Office, Huntington, West Virginia, February 29, 1932."

By Mr. THOMPSON. Is there any name signed to that?

By Mr. JACKSON. And I asked to have it marked for identification Exhibit 544.

By Mr. THOMPSON. I object to it being considered at all.

By the COURT. What is it?

By Mr. THOMPSON. I understand these are studies made by the department, but it is an inter-office document.

By the COURT. I am not concerned with what sort of document it is, but I want to know if it has any purpose in here. Is that the result of any experiments he made in connection with the Government?

By Mr. JACKSON. If Your Honor please, here is a letter from Major Fred. W. Herman, now Lieutenant Colonel Herman, transmitting this document to us, and you will recall that it is on the release of the experimental wave study that was made in cooperation with the U. S. District Engineers Office, the U. S. Geological Survey, and the defendant.

By Mr. THOMPSON. What is the date of that letter?

By the COURT. March 7, 1932.

By Mr. THOMPSON. And that letter is addressed to Col. Scheidenhelm?

By the COURT. Yes, Consulting Engineer of the defendant here.

By Mr. JACKSON:

Q. I show you this book marked defendant's exhibit 544, and ask you to state whether or not that is the book out of which you just tore records of the maneuvers on the wicket dam?

By the WITNESS. (Examining book.) Some of this material at least appears to be the same as that in the book of computations and memoranda from which I took that sheet describing the operations of the wickets.

By Mr. JACKSON:

Q. Yes; that is the volume you produced here?

A. Did I produce it?

By Mr. THOMPSON. He didn't say he produced it.

By Mr. JACKSON:

Q. I thought it was here. You testified as to the effect of Wave No. 4, at Dam 9, and I call your attention to the sheet marked Wave 4, in connection with wave study originated above Ivanhoe March 12 to April 1, 1930, in Defendant's exhibit 544, and ask you to state whether or not that does not show that wave 4 was reported as undistinguishable at Lock 9?

By Mr. THOMPSON:

Q. Was your statement based on the page he is showing you now?

A. No, sir.

By the COURT. No, sir; but on the data on the bound volume there. Where did you get that data?

A. I might explain that I made my studies primarily from the two charts which were complete records of the waves. I looked over the mass of computations and the only thing that I can recollect that I paid attention to was a sheet of wicket manipulations,

which I gave to Mr. Jackson a moment ago. It is a study made by some engineer in the Huntington office and this is an office memorandum of the sort you frequently see and the study is unfinished. It says that it is incomplete, and I disagree heartily with a number of his findings. I made very little use of it. I looked it over in my study of the subject. I made no use of the consequential part of it. It had contained within it some basic data as to the maneuvers with the Weir Wickets, which I did use.

1932

By the COURT. What are you going to do with the paper in your hand, Mr. Jackson. Is it something in regard to the contradiction of the witness?

By Mr. JACKSON. Yes, sir.

By the COURT. You will show him a detailed compilation of some sort, made in the Engineer's office, and this is in contradiction of some statements he has made, which affects the weight to be given some statement?

By Mr. JACKSON. Yes, sir. It is a record of the day and hour that the center of the crest or peak occurred at particular dams of Wave 4, which is one of the two waves he selected as examples and made the subject of his testimony. He testified as to Lock 9, and it is the observation of the engineers that collected the data that at Lock 9, the wave was undistinguishable.

By Mr. THOMPSON. If he was about to impeach the witness about some document or statement that he had made, all right, but here they bring in a document where we know nothing of the engineer that wrote it—we do not know who he was. The engineer says that it is totally incomplete and has errors in it and will have to be changed and write to Colonel Scheidenhelm to that effect, and now they seek to bring it in here to impeach this witness.

By the COURT. Yes, sir; he said it was incomplete, but the record of the actual action of the waves is not incomplete, because these waves have come down and have been described under actual observation and the measurement of the wave is shown in the evidence and shows that it disappeared at a certain point downstream.

By Mr. THOMPSON. These observations are totally incorrect, because the Major in charge said they were not correct.

By Mr. JACKSON. It looks like the Lieutenant Colonel would be helpful in solving this uncertainty.

By Mr. THOMPSON. I will read that part of the letter again: "You may find errors and inconsistencies in this, in which case, I will be glad for your corrections and suggestions, that the study may be made complete and correct. The engineers are continuing along the same line and will have further data in a few weeks."

By the COURT. You may find inconsistencies——

By Mr. THOMPSON. Suppose they read a part of it, which is admittedly incomplete, and ask the witness if he did not testify in such a way, doesn't that make a record as if he was incorrect in what he stated?

By the COURT. That will not affect him. Here is a witness testifying on engineering knowledge and certain data that he has assembled, and he has stated certain conclusions, and has made a chart embodying those conclusions. The defendant proposes to show that there are in the records of the Engineer's Office in Huntington or in Cincinnati, whichever it is, a record of compilations and tests, on which he spoke, which shows something different from what he says. It goes to the weight of his theoretical testimony.

By the COURT. The only objection I see to it is this: Of course, it could not contradict the witness, if he did not make the record, but it can be used to this limited extent—the witness having testified and based his conclusion on certain things, may be shown records made by other persons, actually on the scene, and asked if that record shows otherwise, if it would influence his conclusion in any way.

By Mr. THOMPSON. There is no signature to show who made the record.

By the COURT. It was conceded that it was made in the Huntington office.

By Mr. THOMPSON. Suppose the greatest Engineer in the world said he made it, it might influence him, but suppose some subordinate gathered the figures that go to make it up.

By the COURT. I do not think that will influence this witness.

By Mr. THOMPSON. We ask for an exception to the ruling of the Court of testimony in regard to this record and also to the admission of it, for reasons stated.

By the COURT. All right, sir. Ask him if the record was otherwise, if there is any reason known to him to doubt the accuracy of his conclusions and judgment.

By Mr. JACKSON. Read the question. [Question is read.]

By Mr. JONES. There was something they wished to use on cross-examination and did not offer.

By the COURT. Yes, sir. Of course they will have to prove it, if introduced.

By Mr. JACKSON:

Q. You may proceed, Mr. Gerdes.

1933 A. May I say that—in the first place—that the record you show me is not the record of the wave itself. That is shown on the chart, Gov't. Exhibit 228. These are computations which apparently were made from tests of wave 4.

Q. Does this sheet on Wave 4, in defendant's exhibit 554, state that at Lock 9, that that wave was undistinguishable?

A. This sheet states——

By Mr. THOMPSON. It does not say who said that.

By the COURT. He asked what was on the sheet—if that was on the sheet.

By Mr. THOMPSON. May we have an exception to the ruling of the Court?

By the COURT. Yes, sir.

By the WITNESS. This sheet says it was undistinguishable at Lock 9; yes, sir.

1934

* * * * *

By Mr. JACKSON:

Q. Exhibit 228 that you introduced indicates in the corner that it was made in the office of the Engineer in Huntington, does it?

A. Yes, sir.

Q. Does the fact that the sheet on Wave 4, on defendant's Exhibit 544, shows that that wave was undistinguishable at Lock 9, shake your opinion that you have expressed as to the adverse effect of Wave 4 at Lock 9, in these tests in 1930?

A. My judgment as to the influence this wave had at Lock 9, based upon the record of the wave itself, shown on Government's Exhibit 143 and No. 228, I believe—my judgment is based on that and not upon any computations or deductions made by other people. If the Court cares to, he may look at the record of the Wave 4 itself on the sheet, Government Exhibit 228.

Redirect examination by Mr. THOMPSON:

Q. On cross-examination, you said that the waves from the Radford dam—some of them—would pass through Bluestone under certain conditions and go down the river, and you gave one example. Can you give any other examples?

A. Yes, sir.

Q. Give them?

A. There are a number of conditions, as I previously stated, that might operate to cause that. Without going through a thirty or forty year hydrographic study of the Bluestone, I will name a few of them that occur to me:

One condition would be where the flow at Bluestone was in excess of the pow'r units that might be installed there and that water was being stored at Radford. The release from Radford reservoir, being through the power plant, the formation of waves, as I have described, which would go down New River and pass through Bluestone and over the spillway, as I have described. The flow of New River above Radford might be in excess of, say, 3,000 second-feet, but the excess over the release, whatever it

might be, let us say, 9,000 second-feet, for approximately
1935 ten hours, being stored at the Radford reservoir.

Another condition might arise when the stream-flow at the Radford reservoir was approximately equal to the regulated power wave released from Radford, but if the New River water shed were supplying sufficient water to Bluestone to again cause the water to be released from the spillway, the essential condition for the passage of the water wave through Bluestone to New River being for there to be free discharge—over the spillway at the time the power wave arrives.

Another condition would be when flood waters had been impounded in the Bluestone reservoir and were being released; the flow of the upper New River having been regulated at Radford, and the power plant operating in its normal cycle, as I described in Exhibit 226.

Still another condition would arise on week ends when, if we assume Bluestone might be supplying public utility load peaking and be shut down Friday afternoon and the wave would come in from Radford on Saturday or Sunday and go over the dam with the discharge of free water, if there be any.

These selections or examples are selected at random. There may be others.

Q. When the flow at Bluestone is 11,000 second-feet or more, is it possible that the Appalachian Electric Power Company could store water at Radford?

A. That is correct; yes, sir.

Q. You were asked by counsel on cross-examination with respect to the hatched figures at the top of the waves on Government's Exhibit No. 226, and he called your attention to the fact that on the first day the hatched part was much smaller or one third of the size of the second day, and perhaps the third day. How much would it change the picture on that exhibit if the Buck and Billesby and Reusens carried 35,000 kilowatts of peak each day of the week?

1936 A. This diagram, Exhibit 226, was drawn, as I stated, to present simply an informative picture of the typical operation of the Radford plant. If the Buck and Byllesby and Reusens plants were to carry a peak load of 35,000 kilowatts on Monday, it would simply result in moving the white block indicated as Radford down approximately 20,000 kilowatts on the load scale, withou' otherwise affecting it, and would not in any way affect the description of peak load operation of power wave production previously described by me.

Q. Mr. Gerdes, have you ever designed a hydroelectric plant?

A. I have.

Q. Have you ever had experience in working on plans of others being designed?

A. Yes.

Q. When is the determination made as to whether or not the plant shall be a base load plant or a peak load plant—at what time in the planning of the project?

The decision is made—let me say first, a hydro-electric plant, like other large and costly installations, is not built at random, and before a hydro-electric plant is designed, very careful consideration is given to the place which it will occupy in the system of the company planning it. In other words, what part of that company's load it will serve and the other functions it will fill; how it will fit into the scheme of the operations of the company, and I might say that the decision as to whether a hydro-electric plant is to be a peak plant or base load plant, is completely made and definitely committed when the plans for that project are finally decided upon.

That is considerably in advance of the construction of that plant. In the case of the Radford project, I would say that the plans were complete when the application was made to the Federal Power Commission.

1937 Q. Is the method of operation generally known or determined before the plant is built?

A. The method of operation as to peaking or base is decided upon by the responsible executives of the utility company building it before it is built. The operating officials who run it after it is built, have very little control over whether or not it is to be operated as a peak or base load plant. That decision is made before the plant is built.

Recross examination by Mr. JACKSON:

Q. Could there be a condition where the Radford project would be responsible for an increase in height or discharge over Bluestone spillway without a corresponding consequent dampening of the Radford wave in its hypothetical travel through the Bluestone reservoir.

A. Will you repeat the question. (Question is read.)

Q. Are you a little uncomfortable?

A. No, sir. Your question is not very clear. That seems to be a habit with you. Will you read the question.

If the Radford wave—that power wave released from Radford—would reach the Bluestone reservoir at a time when the water was spilling over the fixed crest of the Bluestone dam—it would be dampened to some extent through the Bluestone pool—that is, it would have to pass down New River in the event the Bluestone was not there at all. There would be an increase in the

discharge over the Bluestone spillway occasionally, by the arrival of this wave through the Bluestone reservoir at the spillway. The wave would be somewhat less at the Bluestone spillway than at the head of Bluestone pool, but I can say that dampening passing through Bluestone pool would be less than the corresponding dampening which would take place or which might take place in the passage down the corresponding section of the New River.

Q. That is, if there was no Bluestone?

A. Yes, sir.

1938 (Exhibit 231, being a letter dated March 1, 1928 from the Applachian Electric Power Company by Curtis, Mallet-Prevost, Colt & Mosle to the Federal Power Commission, was marked for identification.)

(Exhibit 232, being executive order authorizing the contruction of the Bluestone Reservoir Project on New River, West Virginia, was offered in evidence.)

(Exhibit 233, being a letter from William W. Belknap, Secretary of War, in answer to the resolution of the House, on February 3, 1871, House Document 110–, re James River and Kanawha Canal was offered in evidence.)

Defendant objected to the admission of Exhibit 233 on the ground that the same was irrelevant.

(Exhibit 234, being an excerpt from the Congressional Globe, pages 205–6, of December 16, 1872 in which is reported the Senate action authorizing the Windom Committee, was offered in evidence.)

Defendant objected to the admission of Exhibit 234 on the ground that the same was irrelevant.

(Exhibit 235, being a Journal of the House of Delegates of the State of West Virginia for the Eleventh Session, 1872–73, re James River and Kanawha Canal, was offered in evidence.)

Defendant objected to the admission of Exhibit 235 on the ground that the same was irrelevant.

(Exhibit 236, being Report of the Committee of the House of Representatives, containing Report No. 76, Forty-second Congress, Third Session, was offered in evidence.)

Defendant objected to the admission of Exhibit 236 on the ground that the same was irrelevant, and further reserved the right to object to the competency of the same.

(Exhibit 237, being pages 199 and 200 of the Congressional Record containing the proceedings of the United States Senate at a Special Session of th Forty-third Congress, 1873, was offered in evidence.)

Defendant objected to the admission of Exhibit 237 on the ground that the same was irrelevant.

(Exhibit 238, being a report of Major Craighill containing a report of Messrs. Hutton and Harris, entitled "James River and Kanawha Canal, United States Engineer's Office, Baltimore, Maryland, April 11, 1873," was offered in evidence.)

Defendant objected to the admission of Exhibit 238 on the ground that the same was irrelevant.

(Exhibit 239, being a letter from Senator Davis of West Virginia, dated November 12, 1873, to Belknap, Secretary of War, re James River and Kanawha Canal, was offered in evidence.)

Defendant objected to the admission of Exhibit 239 on the ground that the same was irrelevant.

(Exhibit 240, being a report on the James River and Kanawha Canal entitled, "Report of the Board of Engineers, March 18, 1874", was offered in evidence.)

Defendant objected to the admission of Exhibit 240 on the ground that the same was irrelevant.

(Exhibit 241, being Report 307, Part I, Senate, Forty-third Congress, First Session, by "Select Committee on Transportation Routes to the Seaboard", was offered in evidence.)

Defendant objected to the admission of Exhibit 241 on the ground that the same was irrelevant.

(Exhibit 242, being pages 4989–4992 inclusive, of the Congressional Record, containing the proceedings of the Forty-third Congress, First Section (1874) re the Windom Committee's report, was offered in evidence.)

Defendant objected to the admission of Exhibit 242 on the ground that the same was irrelevant.

(Exhibit 243, being Act of Congress passed June 23, 1874, re estimates and surveys on transportation routes to the seaboard, was offered in evidence.)

(Exhibit 244, being report of Major Craighill entitled "Third Subdivision of the Central Transportation Route" January 13, 1875, was offered in evidence.)

Defendant objected to the admission of Exhibit 244 on the ground that the same was irrelevant.

(Exhibit 245, being letter from the Secretary of War, etc., Senate Document No. 15, Forty-fourth Congress, Second Session, containing the reports of Major Craighill and Brig. Gen. Humphreys, was offered in evidence.)

Defendant objected to the admission of Exhibit 245 on the ground that the same was irrelevant.

(Exhibit 246, being U. S. G. S. Report No. 20, the Whitetop Area Virginia-Tennessee, was offered in evidence.)

Defendant objected to the admission of Exhibit 246 on the grounds that the same was incompetent if offered with reference

to any feature of navigability and irrelevant if offered for any other purpose.

All of defendant's respective objections to the foregoing Exhibits (231–246 inclusive) were overruled and exceptions were duly taken.

1939 *Section 2. Defendant's main case.*

Mr. ABBOT. If your Honor please, we have a location map, marked "Defendant's Exhibit No. 545," and counsel for the Government has agreed that it might go in as showing approximate locations, towns and places that will be referred to by witnesses, but it is not meant to be accurate with reference to the State lines, for instance, or minute locations of places.

They may be shown differently by the testimony of witnesses, but this is simply to enable us to follow the testimony.

Mr. THOMPSON. We have no objection provided it does not attempt to show the State line; it is the approximate locations of towns, rivers, and so forth.

Mr. ABBOT. If your Honor please, they say that I said it was not accurate as to State lines, but I meant to say it was no evidence of State lines.

(Exhibit 545 introduced in evidence.)

C. RUFUS SANGLER, on Direct Examination, testified as follows:

I have lived all my life one mile north of Peterstown and will be eighty-eight years old October 24th.

I remember something concerning the time before the C. & O. Railroad was built from White Sulphur Springs down to Hinton. I hauled from White Sulphur down below Hinton, and through Lewisburg, for a fellow named Minafee, down below. He was a railroad contractor. We did the hauling on wagons which we loaded at White Sulphur Springs. We hauled right through Lewisburg, up by Blue Sulphur, and turned to the left at Blue Sulphur and went over the mountain down to Lick Branch, I think, where Minafee had his work. That is on New River, below where Hinton is now. At that time there was no town called Hinton. I think there was a man by the name of Hinton that lived there, and lived there before this road come down. I don't know how many teams were engaged in that hauling. My father was there with three two-horse teams
1940 and one four-horse team. I was driving one of the teams for my father. Before the C. & O. Railroad was built, the people in the neighborhood of Peterstown, the Narrows, Glen Lyn, and Rich Creek, got their supplies and got their products

market by hauling to Dublin Depot. I hauled to Dublin Depot.

In the Civil War my father was a Wagon Master and General Forage Master in the Confederate Army, I think, in the 45th Regiment. His duties were to look after the wagons and teams and supplies. I don't know how many teams or wagon trains he had charge of. I think probably he had charge of several trains. I think he had a Wagon Master for each train and a General Wagon Master to look after forage. He hauled food stuffs for the Army. I drove one of his teams from our place at Peterstown to New River Bridge, as they called it then, down to Radford.

I recall when the Norfolk & Western Railroad was built down New River and up East River. I don't know the date, but I remember I hauled a lot of stuff from Lowell to the Norfolk & Western, between East River and Bluefield. I don't remember how long I was engaged in that hauling but I suppose something like two years. There were three or four other teams doing the hauling with me. We kind of went together—a fellow named Dunn, and Williams and myself, and my brother. The road was so bad we could hardly haul. I remember a man named Sadler, who lived near where Glen Lyn is now. A man by the name of Rhinehart and Sadler had the contract to build a piece of road, but I don't know just how much. I think my brother hauled some stuff for them, and I don't remember about the other. There were several teams doing this hauling on the road between Lowell and East River besides ours. I don't remember how many, but I should guess five or six—my brother and myself and Charlie Dunn and Williams. I was engaged in that hauling constantly during the time of that construction. I had a contract with Mr. Kitchpaw. While I was engaged in that hauling did not see any supplies boated up New River.

I recall that there was one stage line road through our place from Red Sulphur to Dublin Depot. After the C. & O. Railroad was built to Lowell, the stage came right on through to Lowell. They had some hacks too. I don't think there was any stage operating between Peterstown and Lurich after the Norfolk & Western was put in operation to Lurich. They had pretty well stopped coming to the Red Sulphur. I think people who came for their health quit coming to Red Sulphur and went to White Sulphur. I think it would take us about five days to make the round trip from Lowell up the East River in hauling. Lowell is on the C. & O. on the Greenbrier.

The witness, on Cross Examination, testified as follows:

I have lived at or near Peterstown, within a mile of it, all my life. I was born there, two miles from New River. I cannot see the river from where I live. There was a road from Peterstown to New River in my youth, and I have forded it many a time. The road went up the river to Pearisburg after crossing the river. It then went to Dublin. It is thirty miles from Peterstown to Dublin. That was the only road to the river anywhere near there. From Peterstown to Glen Lyn was five or six miles. Narrows was above and I believe they call it six miles from the Narrows to Peterstown. It was ten miles from Peterstown to Pearisburg.

I recall when the railroad was built into Hinton. I suppose it was built from about the White Sulphur, but I don't know where it went. I don't know that there was any particular name to it. There was an old ferry down there that they called Pack's Ferry, Hinton was four or five miles below Pack's Ferry and there was a man named Hinton lived there, and they named the town after him. The railroad was built to Hinton. I don't know whether the railroad was built from White Sulphur or not but we hauled from White Sulphur. The White Sulphur I hauled from is on the Greenbrier—the other side of Union and Monroe.

We did not go by Hinton when we hauled. I expect it was forty or fifty miles when we hauled by wagon. We did not go by Hinton. We started at White Sulphur and came through Lewisburg, Blue Sulphur and turned to the left over the mountain to Lick Branch. I think Minafee had the contract there. We hauled to Lick Branch, down below Hinton. I could not tell you how far below Hinton we went, but it was on the right side of New River, going down stream. We did not cross New River in hauling to Lick Branch. The railroad was being built right there.

We hauled railroad supplies and powder, and, I suppose 1942 stuff to feed the hands on—flour and meat, blasting powder and probably a lot of tools.

I don't know of any wagon road which went to Hinton from where we started to haul our stuff down the Greenbrier. I never took any. We went through Lewisburg and Blue Sulphur. The road we drove over was a bad one, built out of the hillside and you couldn't see the bottom hardly down in places. It was kind of dangerous and just wide enough for a wagon. Driving over this road was difficult and a man had to know what he was doing. After we left the main hills it was bad. The other road was in better shape and traveled by people.

I can't remember just how long we were doing that driving over there. I don't remember what time we were there. We stayed from the time we went there until about Christmas. We must have gone there early in the Fall and we did this driving maybe two or three months; I can't say. My father had three teams. There were two or three other teams maybe; I don't know.

I testified that the people got their supplies by wagons. The people I was speaking of were the railroad builders who had contracts with the railroad. I hauled for them, and these other wagons hauled for them also. This point at which they were building on Lick Creek was just along near New River. I expect it was several miles below Hinton. I don't believe I know where Sandstone Falls is, and don't remember ever seeing it, while we were hauling. We went and unloaded and went right back. It took us a whole week to make a trip. I don't think this point on New River, to which we hauled the stuff, could have been over fifteen or twenty miles below Hinton. It might be further and might not be quite as much. It was below Hinton, but I don't know whether it was below Sandstone Falls.

I spoke also of hauling from Peterstown to Dublin. I stated that I started at Peterstown with a wagon load of produce for Dublin. Dublin is not as far along as Radford from our place. We would cross the river two miles from Peterstown when the river was low enough to ford, and when it was not we went up the river a mile to the Hobb's Ferry. They called it thirty-one miles from Peterstown to Dublin. Dublin is not on New River. I don't suppose you could get to Dublin on New River. All we had to do to get from Peterstown to Dublin was to cross New River. He had been running that ferry there quite a while. I don't know how long it had been operating. I ferried it there when I was fifteen or eighteen years old and it operated
1943 for many years after that. People that traveled that road used this ferry. It was thirty-one miles from Peterstown to Dublin. We generally gave our horses plenty of time, and much of the time it took us five days to make the trip there and back. The road from Lowell was in bad shape. When it was rainy, the road got worked up so bad they couldn't travel it in places, and had to go around it.

To the best of my recollection, I hauled from Lowell when they were building the N. & W. We could bring the stuff from Lowell up the East River to where their contract was. Lowell was on the Greenbrier, twenty-four miles from Peterstown, considerably down from White Sulphur. I don't think Lowell was more than twelve or fifteen miles from Hinton. I have been from Lowell to Hinton on the train once or twice and did do a

little hauling from Crump's Bottom up to Big Bend Tunnel above Hinton.

I have no idea of the exact time when I hauled from Lowell for the N. & W. It was a long time ago. I don't even know how old I was then. It was after I hauled for the C. & O.; how long after, I don't know. This was railroad hauling, the same as the other was.

I expect that there was a wagon road from Lowell down to Greenbrier to Hinton at the time I did the hauling from Lowell for the Norfolk & Western, I don't know. I remember hauling grain from Crump's Bottom to Big Bend Tunnel; there had to be a road to go up to it across the river at Greenbrier, that went up Greenbrier, where they were building the tunnel. That was not more than three or four miles. I don't know whether there was a road from White Sulphur down to the Greenbrier when I drove to Lake Creek. We didn't go by Hinton.

I don't think I was thirty years old when I did this hauling for the C. & O. I expect that was done over sixty years ago. I can't say.

The road from Lowell to East River was a bad one. It had got worked up mighty bad, and so much hauling over it cut it to pieces and we had to leave the road in places and go through the woods a piece. It was a dirt road. I don't think there was any other road from Lowell to East River at that time.

I don't think there was a town at Hinton until after the railroad was built. I don't know. The first Hinton they called
"Upper Hinton" and later the other was called "Lower
1944 Hinton." I passed there first when I was hauling that stuff at Big Bend Tunnel. That was after I hauled from White Sulphur. I couldn't say whether it was after or before I did this hauling from Lowell to East River. They was building at Big Bend Tunnel, bought grain and hauled it from Crump's Bottom. They had some good bottoms and raised some corn, and sold it to some contractors, I don't know who they were. You could haul fifty or sixty bushels of corn on a wagon. If you had a good four-horse team you could haul forty or fifty hundred pounds. Sometimes we used six horses. Of course, we broke down sometimes. I don't remember about having to unload.

I never saw any boating up or down New River when I was hauling to Dublin. I saw the ferries, of course. Clark's Ferry was above there and one at Narrows tended by Clark. There was another up above there, I think it was Clark's, too, located on Chap Johnson's farm.

We were making trips to Dublin fairly regularly. I couldn't say, sometimes we might go every week and sometimes two or

three weeks you know, just when we had stuff to haul off. At that time we did not have any other places to go beside Dublin. There was nothing at Narrows or Glen Lyn. We had stores at Peterstown and we could shop there. These stores obtained their supplies from Dublin. On our trips to Dublin from Peterstown we crossed the river on the ferry. I don't know just how wide the river is at this point, three or four hundred feet, I reckon. I may be away off. It might even be more. It was a pretty wide stream. It took five or six minutes to cross on the ferry. Of course, it depended a lot on the condition of the water. If the water was low, the boat would not run so fast and if strong it pushed it along. After crossing the ferry on the way to Dublin the wagon road went along the side of the river for five or six miles and bore to the right. I cannot give you the years I did this hauling to Dublin. I have never in all my life seen any boating on that river except the ferry boats.

The witness, on Redirect Examination, testified as follows:

When I hauled to Dublin, we forded the river when it was low enough to ford. Dublin was the nearest point from Peterstown, to and from which we did this hauling. We went to Dublin
1945 because there was a railroad through there. There was a railroad station, and the goods were ordered and wagoned to Peterstown. They went to Dublin first, and then, after the Lowell road was built, they went to Lowell. There was not any road over there then. I hauled this corn from Crump's Bottom to the Big Ben Tunnel by wagon.

W. H. SPANGLER on Direct Examination, testified as follows:

I was born in 1870, in Peterstown, Monroe County, and was living there when the N. & W. construction work was going on up East River. While the N. & W. was being built I worked for Charlie Dunn. He used me as a helper first and then I drove a team for him. I went on the wagon with him as his helper on a few trips.

Q. Do you recall who supplied the people working on the N. & W. Railroad up East River with their supplies?

A. I can give part, the part I was interested in. Charlie Dunn had three four horse teams and he supplied two companies, Griffith and Purcell, had a contract there, and he wagoned for them.

Q. Were they working on this river up above Glen Lyn?

A. Their contract was at a little station, Willowtown.

Q. Do you remember how far that is up the river?

A. That don't go up East River, you leave East River there at Glen Lyn, and this is the way the railroad goes around on the

other side of the hill, I have an idea about three miles. [Indicating.]

Q. How long did he do that hauling?

A. Well they was at work there something between two and three years. I couldn't specify the exact time.

Q. Was it done pretty regularly?

A. Yes, sir; it was every week.

Q. And how long did it take to make your trip, the whole trip?

A. Well that was owing to the weather, good weather we could make a trip in a week.

Q. And if bad weather?

A. We didn't make one so quick, and we had the river to
1946 contend with, high water lots of times.

Q. When it was high water how did you get across?

A. Had to lay still till it got down.

Besides the teams which Mr. Dunn had, my uncle had a team engaged in hauling supplies from Lowell to East River. My Uncle Allen Spangler and Coon Spangler had a team and Uncle Allen's boys, Bud and Routh, had a team, but not steadily. Fletch Spangler also had a team there. The Spanglers have done a lot of hauling in that section for a great many years. They were all teamsters at that time, as there was no way of transferring stuff but by teams. All my people were teamsters. I hauled about two years.

Q. How often or how long during that time were you on the road, were these wagons on the road hauling or getting back from hauling?

A. They was on the road all the time. Of course if the trip was short they wasn't on the road so long, and if long, you know they was on the road constantly, all the time this railroad work went on, they had to have their supplies.

Sometimes in making that trip, we would ford the river at Lurich or down below Lurich. Anyway it was above the old Shumate Home, a little ways from the Virginian Station. We would sometimes ferry across. On the New River side we were along the river about two and a half or possibly three miles from the Virginian Station to the mouth or where the bridge is across the river now, that is, from Rich Creek to Glen Lyn. While I was doing this hauling I never saw any supplies hauled by boat to the railroad or to the contractors working on the railroad. I recall a stage line from Lowell to Peterstown. The passengers changed at Peterstown. They had other teams there and one team was run from Peterstown to Lurich to meet each train. These teams went through Lowell, but they transferred their passengers off on to these hacks which were made to ford the river with. The line went from Peterstown to Lowell.

The witness, on Cross Examination, testified as follows:

I can only recall the time when the C. & O. was built or
1947 was graded up to the Big Bend Tunnel. I think I was somewhere around eight years old. The C. & O. was being built for several years. They never got through the tunnel. Several years expired and after they got it driven it fell in. I don't think there was any traffic from Hinton east until the Big Bend Tunnel was finished, but I am not sure. Lowell is on the Greenbrier twelve miles, I believe, above the mouth of the Greenbrier. Hinton is at the mouth of Greenbrier. It was about twenty-nine miles from Glen Lyn to Lowell by wagon road. I have an idea it is about thirty or thirty-two miles from Glen Lyn to Hinton up the river. I know it was 16 miles from the mouth of Indian Creek. At the time I was hauling, there was a road from Hinton to Glen Lyn which you could take by crossing the river.

Q. Now at the time you were hauling, there was no road from Hinton to Glen Lyn, was t re?

A. There was a road by rossing the river, you could come up there close to the mouth of Indian Creek, then ferry over the river and get on the other side and come up.

Q. Hinton was on the C. & O. railroad the same as Lowell?

A. Yes, sir.

Q. You never hauled anything from Hinton to Glen Lyn?

A. No, sir.

Q. The reason you did not was because there was no road that you could travel?

A. The road ran up on one side of the river, up here to the mouth of Indian Creek, and then it ran up on the other side, up to Glen Lyn, and they had a salt works there.

Q. Do you mean after you left Hinton it came on the left bank going down and crossed at Indian Creek?

A. No, sir; two miles of Indian Creek, but this road continued up there, then went up Indian Creek to Red Sulphur Springs.

Q. That is on the right bank of the river going down?

A. Yes, sir; that is right.

Q. And it is some four or five miles from the river to Red Sulphur Springs?

1948 A. Six miles, I think.

Q. Now you did not haul any supplies from Hinton to the Norfolk & Western, or from Hinton to Glen Lyn up that road, did you?

A. No, sir.

The route from Lowell to Glen Lyn was right over the mountain. There was not much road there then and there is none

through that country yet. It was a very tough pull. We had four horses in good weather and six and eight, and sometimes ten and twelve, in bad weather. With four horses we hauled six thousand pounds when the roads were good. When the roads were bad we doubled the horses up and put on another team, and if they didn't get the load up, we put on another team. We never put ten horses on a wagon to make the trip from Lowell to Glen Lyn. Sometimes we would get stuck with a wagon in the mud and it would take eight or ten to pull it out and we would get these horses from the other teams, that is, from the other wagon. It would take a week in good weather to make the trip from Lowell to Glen Lyn and back, but we went up as far as Bluefield, which is fifteen miles beyond Glen Lyn. There were three camps up East River. I couldn't tell you the time took to take this trip in bad weather. We never took as much as two weeks on such a trip, but I would not be positive. It took more time on some trips than it did on others and especially when you struck these bad sections of the road with deep mud. We never stopped hauling in the winter time, but it took us longer.

I am acquainted with the wagon road as it existed at that time from Peterstown to Dublin. Leaving Peterstown we crossed New River somewhere up near Gly Lyn either by ford or ferry, and then went up river to Pearisburg. Then we left the river and had to go across several mountains, including Little Walker Mountain, Big Walker Mountain, and several others. There was the same kind of mountainous territory to cross as we had to go from Glen Lyn to Lowell, and the roads were just as bad. If I had to guess, I would say it is right around thirty or forty miles from Peterstown to Dublin, but I would not be positive about that. Dublin was not on New River. I think it was further than ten or fifteen miles west of the river. I have in mind that it was about twenty miles. Dublin and Radford are both on the N. & W. which crosses the New River at Radford. I am familiar with the New River country between Radford and Hinton.

1949

Q. You know that prior to the time the New River division of the Norfolk & Western was built in by Glen Lyn and on up to Radford, you remember this road that you said you did some hauling on?

A. I didn't do any hauling from Radford.

Q. I mean at the time that division was constructed by Glen Lyn, prior to that time, there was no railroad between Hinton and Radford?

A. No, sir.

Q. And there is none now between Hinton and Glen Lyn?

A. No, sir; there is none now.

Q. And the C. & O. came into the New River Valley up New River until it struck Hinton and then it turned east and followed the Greenbrier?

A. Yes, sir.

Q. And the Norfolk & Western came from the West over in Tennessee, and I am talking about the main line that was constructed before the Civil War?

A. Yes, sir.

Q. And it came from the westward and passed through Pulaski or Martin's Tank then?

A. I don't know about that.

Q. I mean where Pulaski is now, then to Dublin and Radford and went on east from there. It did not go down New River, did it?

A. I couldn't tell you about it after it left Radford, I never was any further east than Radford.

The nearest station on the railroad to Peterstown was Dublin before the C. & O. or the New River division of the N. & W. were built. Prior to the construction of the C. & O., Dublin was the nearest. Lowell was twenty-four miles, and that is where I did my hauling. Lowell was on the C. & O.

I think they were working on the Big Bend Tunnel in about 1878. I was eight years old when my father died and my father had two four-horse teams, and I had two brothers who were hauling then from Peterstown to Dublin. A little later on, when they got this tunnel driven, they brought that stuff over the C. & O. through Monroe County, and I don't know whether 1950 it was closer or cheaper, but they cut out the hauling to Dublin. I did some hauling myself. I had a brother-in-law who had three teams there when they built the New River division of the N. & W. I figure I was about ten years or twelve years old then although I don't know just the year when the N. & W. was built.

The stuff I hauled from Lowell to Glen Lyn consisted of hay, corn, meat, anything in the eating line, and whiskey. They had a camp way back in the mountain. I hauled these across New River, and the farthest I came was right next to Bluefield. I hauled for at least two years, possibly three.

Q. Now you stated to Mr. Abbot on your direct examination that you saw no boating coming up to Glen Lyn while you were hauling across the river to Glen Lyn?

A. That is, you mean when I was hauling to the railroad?

Q. Yes; you did not go up and down along the bank of the river in making that trip, did you?

A. No, sir.

Q. You just crossed New River?

A. And I don't think I gave it to him that way.

Q. I may be in error.

A. I don't know, if I did, I was mistaken. We only followed the river from this Virginian station that is on the river now down to Glen Lyn. Then I was down on this river for about four or five years.

Q. Where was that?

A. On Crump's Bottom. My brother-in-law had that Crump's Bottom rented out, 1,000 acres, and I was there from the first of September until the first of June of the coming year, but I wasn't there the full year round.

Q. What year?

A. I couldn't tell you that.

Q. Was it before you did this teaming or after?

A. It was afterwards.

Q. Then you don't know whether there was any boating up by there or not, do you?

A. As far as I know there wasn't.

1951 Q. I am asking you if you know of your own knowledge?

Or when you told Mr. Abbot that, did you mean that you just didn't see any in making your trips?

A. I never seen any there.

Q. I am asking you if——

By the COURT. Let him finish his answer.

A. While I was on the river all the time, I never seen any.

Q. I am asking you about the answer you gave to Mr. Abbot, that when you did work, I wanted to know whether or not you saw any traffic going to Glen Lyn, when they were constructing the Norfolk & Western?

A. And my answer was I did not.

Q. At that time you were merely crossing the river, and you were not going up and down the bank of the river?

A. Only that distance I told you, about three miles.

Q. And that is above Glen Lyn, isn't it?

A. It is above Glen Lyn as you go up the river.

Q. If there had been any river traffic between Hinton and Shumate's Falls or between Hinton and Glen Lyn you would not have seen it unless you happened to be right at Glen Lyn when the boat came into the East River?

A. Not on that haul.

The country from Giles, Mercer, Summers, and Monroe was fairly good for grazing in those days. There was a sheep raising industry in that country and they raised a lot of cattle.

I have never had any business transactions or connections with the Appalachian Electric Power Company. When I crossed on

the ferry I had to pay so I always forded the river if I could. We always forded when we didn't have anything in the wagon. We would ford if the water was waist deep on the horse and more.

The witness, on Redirect Examination, testified as follows:

Big Bend Tunnel fell in after it was driven the first time. The railroad was not operating through the tunnel at that time. It could have been operating east or west at the time but not through there.

I do not remember when the C. & O. was first built from White Sulphur Springs on down past Hinton. I don't know how
1952 far Dublin is from New River. In answer to a question by counsel on the other side, I think I said Dublin was twenty miles from the river. I was just guessing at that. I was estimating from Pearisburg Station, which is the closest point to the river. That is the twenty miles distance which I gave.

S. L. BUCKLAND on Direct Examination testified as follows:

I live in Narrows, Virginia, on a little farm. I was born in March 1865. I have worked some for the Appalachian Electric Power Company for the last 15 years, off and on, but have never been regularly employed by them. I have worked on Government improvement along New River a little while in my young days when they were making a channel to run a steamboat through. I worked at what is known as Wiley's Falls.

I was raised about two miles above there at what was known as Squire Wiley's farm. It is on the right-hand side of the river going downstream. Round Bottom is on the left side of New River below Glen Lyn. I remember a store which was built at Round Bottom and was run by a man named Lewis Pine and John Monroe and Jim Wiley. This was the first store I knew anything about being run at Round Bottom. To the best of my recollection, that store was something like a quarter of a mile below where that branch comes down over the mountain and runs into the river. I believe the store was right on the lower side of the road.

Q. Is there anything there now to mark the place where the store used to be?

A. I don't know. Of course, if a man was well acquainted there, he might see something that resembled it; the old store is down. There is no store there now.

Q. Do you recall where there were some fruit trees now at Round Bottom?

A. Well, sir; there is two or three fruit trees, to the best of my knowledge, standing around close to where the store was.

Q. Is there a house across the river from Round Bottom?
1953 A. To the best of my ability, when I used to go to Round Bottom, I would say approximately four mile up the river

from Round Bottom, and I used to be there frequently, and there was an old gentleman in my boyhood days named Pendleton that run a ferry there, and I would cross there, and it strikes me it was straight across from the house to about where the store was at Round Bottom, just on the opposite side of the river.

Q. That is, the ferry was right across the river between the Pendleton house and the store?

A. Yes, sir; yes, sir.

When I was a young man there was some grade work done on a farm known as the Bill Reid farm. That was below Round Bottom, just a little distance, in the range of a mile. The only work I did on the railroad up East River from Glen Lyn was to help out for the right-of-way on the Mustard Farm, later called the Gordon Farm. I worked for my uncle, Bill Wiley, cutting a right-of-way for the railroad, that is, taking the timber off and cleaning up.

While the railroad was being built, I took some few trips driving a team hauling supplies up to what was known as Griffith and Purcell's Commissary from the C. & O. Railroad Company. When we could cross the river by fording, we would ford. If that was not possible, there was a boat landing above and one below. You could cross either at Glen Lyn or what is known as the Adair ferry. It was on the Adair land. I was driving for Mr. Dunn. He had other teams. He had a contract for hauling these supplies for Griffith and Purcell, the contractors. There was a man named Williams who lived at Peterstown who had a team or two on that job and also a man named Spangler who had some teams but was not hauling for the same man. He hauled for a man named Kishpaugh who, I think, was a contractor. The hauling lasted for something like a year or a year and a half or longer, quite a while. The teams hauled provisions and stuff, dynamite, powder, ammunition, meat and bread.

Q. Did you ever engage in the stave business?

A. I made staves one whole winter near Pendleton's Ferry.

Q. Is Pendleton the same as might be called Pennington?

A. You have asked me a question I would hate to say,
1954 not knowing. Of course, I been knowing the people and knowed the old gentleman, Pendleton—Old Uncle Billy, we called him, He was a very old man when I was a boy, but still ran the ferry himself, and he had a son called Young Ben that ran the ferry, and a son-in-law, Joe Meadows, but I would not say whether or not it was Pendleton or Pennington, or how it was pronounced.

Q. Did you ever hear the name pronounced Pennington?

A. I always speak broken language. Pendleton is all I would like to say, because not knowing.

Q. Did you ever hear anybody call him Pennington?

A. I don't know that I have, but I don't know that I haven't—only I just wouldn't say.

Charley John engaged in this stave business with me. That winter we made about 70,000 staves. Mr. Dunn, my partner, was handling the business end of this stave operation. He sold them to some man that was shipping them abroad. I think they were bought by some oil companies. The understanding between Mr. Dunn and myself was that we should deliver these staves to New River. He made arrangements with some man to boat these staves. We finally had to haul these staves by wagon to the Norfolk & Western Railroad at Lurich.

I know of some rafting which was tried in Virginia down the river by two men named McCorkle and Walker who came from Greenbrier. They tried to raft walnut logs. They aimed to put this walnut to Hinton to the C. & O. Railroad Company. They built these rafts at the mouth of what is known as East River at what they called Glen Lyn. None of the rafts ever got through that I know of. They would strike the shoals and islands and break up. I saw one tear all to pieces at a little island just below the Wiley House. A man named Alex Skeens was on the raft. He happened to catch hold of some willows and was rescued by George Dickerson and myself. We went in there and took him out in a place we called the "dugout." A man named Collins started with him on the raft but he got off at the upper end of Wiley's Farm.

Q. How many feet of tide was there in the river at that time?

A. You have asked me a question and I would not like to say, but there was several foot and extra water in the river, but
1955 I would not like to say how many feet. That has been a long time ago.

McCorkle and Walker had to stop trying to raft logs. There was no money in it. It went to the bad.

I got out many ties. I ran a tie job on Wolf Creek a couple of miles above Narrows for W. M. McCorkle. At that time the Norfolk and Western Railway was built and was buying ties. We wagoned the ties down Wolf Creek. I could not say how many we cut in that operation but we were on the job there something like two years. We bought one thousand acres of timbered land and worked everything we could into ties. They were not sawed ties but were what we called scored ties. They were good ones; they had to stand inspection.

The witness, on Cross Examination, testified as follows:

I haven't done any work for the Appalachian Power Company to amount to anything for three or four years. I was born in Peterstown. I lost my mother when I was small and my grand-

parents taken me and we lived in a radius of 400 or 500 yards of New River. I have lived at Narrows. I can see New River from where I live. Narrows Depot is not over 100 feet from the New River. We call East River seven miles from Narrows, down New River. Round Bottom is about eight miles from East River downstream. Round Bottom is only about eight miles below Glen Lyn now. It is seven miles from Narrows to Glen Lyn.

Q. How close is the farm where you lived to Glen Lyn?

A. It is 7 miles from Narrows to Glen Lyn. I live back of the Narrows.

Q. And Round Bottom is 8 miles below you?

A. Yes, sir.

Q. Round Bottom is 8 miles below you?

A. Yes, sir; from Narrows.

Q. It is 8 miles from Glen Lyn to Narrows, where you—from where you live?

A. I would make it about 14 or 15 miles down there. Yes, sir.

Q. Exactly. That was my addition of your figures about it.

I did not get to Round Bottom from my farm in those days very often. When I was growing up I went there often, but not in recent years. Sometimes I rode horseback to Round Bottom and sometimes I walked. The road was a very common one on which the brush had just barely been cut out.
1956 They called it a road, but it was not really a road, but they got over it in them days somehow or other. I don't think I ever saw a horse and buggy on that road. I don't think there was anybody there who had one to use on that road, but I saw horses and buggies at that time on other roads.

I was at Round Bottom last something like three or four weeks ago. I went there just to be riding. I went in an automobile with Mr. Abbot there (indicating). I could have located the boundaries of Round Bottom but I was not asked to do so. Mr. Abbot asked me if I knew a man by the name of Mr. Rufus Spangler and I told him that I knew him very well and had known him since I was a boy. After I got there I did not look over the situation. I did not do anything while at Round Bottom to locate the grocery store or anything else that I testified about. It was not necessary because I had traveled as I said, over that country seven or eight years in my boyhood. It had been several years since I had been at Round Bottom. I would not undertake to say how long ago it was. A man ought to be able to fix the place where the grocery store was when he has been in it a dozen times. If I saw the fruit trees I would know about them. Since you have asked me, I would say that I saw those trees on this last trip. I would say that Round Bottom has an area of some six or eight acres. I will not say whether Mr. Abbot and I were

anywhere close to the grocery store or not. We talked about it. I told him I had been there in years past on different occasions. I think that the fruit trees are there but I would not say positively that they are or are not. They were there when I was in Round Bottom several years ago. On this trip with Mr. Abbot I did not go to locate the fruit trees and the grocery store. That was not my business because he asked me to go to Mr. Spangler's with him.

I testified about some grading having been done down along the river. Some was done right along by what is known as the Round Bottom. Some was a little above and some was a little below what is known as the Reed Farm. That was for a railroad which was never built. I can not tell you the year but it was in my young days.

I hauled logs for building the N. & W. Railroad, which was supposed to be started from Radford and to get into the coal fields. At that time they were building it up what was known as East River. The railroad came down New River and went
1957 up East River. It came down from Radford to the junction of East River and New River. There are coal beds up East River at Pocahontas. I never hauled on many trips from Lowell, but Mr. Dunn kept his teams there for perhaps a year and a half or two years. He and Mr. Williams were there for quite a spell. As I said, I hauled meat, bread, black powder, dynamite and material for making the railroad. I hauled to Griffith and Purcell. That was on what was known as the Reed Farm up East River. I crossed New River at the ferry, which was run by a man named Ambrose Owney. I think I hauled ten or twelve miles from the mouth of East River to the Reed Place. I could not recall the distance but it was up East River from Glen Lyn. I hauled supplies for the building of a railroad. The roads were very bad. In some places it would be nearly impossible to go over them, but as we always had several wagons, we would add teams enough to get through by taking a team from one wagon and putting it on another. Usually we had four horses to a wagon.

I don't think I went from Talcott to Hinton except by rail. I did not drive any wagons at this time over the road from Lowell to Hinton.

I made staves back from the river. Some of them I made in a radius of probably one-half a mile from the river and some of them probably three or four miles back from the river. At that time there was a large stand of timber from which staves could be made. We had a regular forest to cut on white oak. We were engaged in this stave operation one whole winter—from four to six months. It was after the N. & W. was built in there. Finally we had to ship the staves out on the N. & W. From where we got them near Pendleton Ferry it was between seven and nine miles

to New River. We loaded them on railroad cars at Lurich. I don't know to what place we shipped them. That is the only stave business I know about. I have never known of any staves made along New River nor ties being cut and shipped down New River. We transported the staves to the railroad by wagon. I was one whole winter making these staves.

Several rafts were started down New River and one struck an island. I don't know whether this was Dickenson Island or Wiley Island. It is about in the middle of the river. I suppose
1958 it amounts to one-half an acre. The last time I noticed it, it was visible in the river. I have no recollection of any raft ever going into Hinton solid without tearing up. I never went on a raft for any distance although I have been on rafts. It was too rich for my blood. Rafting was too fast a life for me.

Q. What about the boats during all that period, you never saw any boats on New River?

A. What kind of boats?

Q. Any kind?

A. Oh, yes.

Q. What did you see?

A. I saw different kind.

Q. Describe them?

A. Boats, skiffs, dug-outs, and bateaux I believe they called them.

Q. Keel bottom boats?

A. Well, now you have asked me something, keel bottom, describe what kind of shape?

Q. The same as a bateau, with a keel bottom, you know a bateau boat when you see one?

A. I don't know what they call one.

Q. You have seen them come up the river from the direction of Hinton to Glen Lyn?

A. Not to Glen Lyn.

Q. Where have you seen them come to?

A. Shumate Falls.

Q. Have you seen them go down the river from East River or Shumate Falls?

A. Not from East River.

Q. Have you ever seen them go down the river?

A. I have seen them go down to Shumate Falls.

Q. What did they have on them?

A. You have asked me a question I am not able to tell you at all, what they had on them, because I don't remember of examining one of those boats to see what they had on them.

1959 Q. What was the date this raft of logs hit on the island?

A. I couldn't tell you the date at all, but it has been several years ago. I was a boy. That was before I was married, been quite a while back.

Q. You say you saw boats come up to Shumate Falls.

A. I have known of them going up to Shumate Falls.

Q. Do you know what they carried?

A. No, sir; I don't.

Q. Weren't they building a railroad at that time near there?

A. No, sir.

Q. Didn't they carry supplies for that force?

A. I don't know, sir.

Q. Can you tell during what period you saw these boats come up to Shumate Falls?

A. No, sir; I can't give you the dates.

Q. What is your best recollection?

A. It was before the N. & W. Railroad was built, Mister. I can tell you that.

Q. That was before the chute was built thru Wiley's Falls, wasn't it?

A. No; that chute was made at Wiley's Falls at that time.

Q. When you saw the boats come up?

A. Yes, sir.

Q. Then the N. & W. was there, wasn't it?

A. No, sir.

I said I cut some ties on Wolfe Creek and hauled them in wagons to the Narrows. Wolfe Creek runs into New River at the Narrows. There was no portion of New River on which I could have taken those ties I cut because New River does not run in that direction. There was a railroad right to Narrows where I hauled those ties. I put them on the railroad at Narrows. I cut all of these ties on Wolfe Creek.

They tried floating those rafts at different times of the year. The raft hit the island along in the spring of the year as I remember. That is generally the time of high water. The high water was the cause of the raft breaking on the island.

1960 In my early days I don't remember ever seeing any boat at Round Bottom. I was there a good deal and when I was there I would stay practically all day. During the time I was there in my boyhood and up to manhood, I never saw a boat come or go from Round Bottom on New River. I saw a ferry boat or skiff there. The ferry boat would take teams across the river. I couldn't recall any boats coming up the river to Round Bottom. I probably was twelve years old when I first used to go to Round Bottom. I went there from the time I was twelve until I was twenty, as I remember.

The raft which was wrecked on the island in the high water was of walnut, which is about as heavy timber as we have I think. I would say hickory is the most difficult timber to handle.

The witness, on Redirect Examination, testified as follows:

I spoke of a man named Owney that ran the ferry at East River. On response to whether his name was Tony, will say I always called him Mr. Owney.

I said that some of the staves I cut were hauled to New River. We started to deliver them to the spot Mr. Dunn said to take them and we probably hauled 3,000 or 4,000 and quit. I had to take a wagon and team and go there and haul some of the staves away from where we had landed them to go down the river on this boat and put them on the wagon again and bring them around to Lurich.

I said in the beginning I was raised on my grandfather's farm, Squire Wiley's farm, on the right bank of the New River. Eight years of my life I was there all the time except when I went to the mill or did something of that kind. I was something like seven or eight years old when I went there. I just remember what they told me my age was when my mother died. After that my grandfather took me. After the eight years I was back there off and on.

Q. What I am getting at is when was it you saw these boats come up to Shumate's Falls?

A. Back in my young days, an old fellow by the name of Charlie Merchant, an old colored man, I would see him once in a while, maybe once a year, something like that, when I was
1961 small, and a man by the name of Buck Smith. I have been at Mr. Smith's home, he lived below what is known as the mouth of Indian Creek, and in my young days them was the only two boats I ever knowed of up New River, in my day.

Q. That was when you were a youngster?

A. Yes, sir.

Q. Living at your grandfather's place?

A. Yes, sir; my grandfather Wiley's.

Q. Do you recall whether there was any additional water in the river at the time you saw those boats come up?

A. They had to have some tide or they couldn't get up without some extra water.

Q. Would you say you saw them come up every year?

A. I wouldn't say because they might make a trip once a year or something like that, I wouldn't say, but it was very very seldom I ever saw a boat in them days, those were the two men. Now I have understood—if this gentleman won't interrupt me—that there was a bateau that was supposed to come from James River, I don't know where it came from, in the fall of '78, that

was anchored on what was known as the mouth of Rich Creek, two miles from Peterstown, but I don't know whether that boat were there or not, I am not able to say, but I always heard there was a boat there.

Q. When was that in '78?

A. When that big flood come on New River, about one of the biggest floods ever known on New River, in the fall of '78.

Q. Can you give any idea of how many bateaux you have ever seen in Virginia on New River, or how many times you have seen a bateau?

A. I have been living, Mister, at Narrows forty odd years, and I disrecall that in Virginia, I don't reckon Giles County is out of Virginia, I hope it ain't, anyhow, and I have never saw one there.

Q. I was getting at how many times you saw a bateau at your grandfather's place?

A. Not often, now and then I would see Charlie Merchant or Buck Smith come up the river, maybe once a year or something like that.

1962 Q. How far did you say Squire Wiley's place, your grandfather's place, was from Round Bottom?

A. About four mile.

The witness, on Recross Examination, testified as follows:

Q. This partnership with Mr. Dunn, in which you say you did the work and he did the figuring, was that the transaction out of which the staves were brought to New River?

A. That was the arrangement.

Q. I am identifying it, it was the one made with Mr. Dunn?

A. My agreement was made with Mr. Dunn.

B. C. LILLY, on Direct Examination, testified as follows:

I will be 57 years old this coming December. I live at Junta. I was born in the Pipestem District and have lived at Crump's Bottom. My father moved there when I was sixteen years old; in 1896.

I remember Colonel John Crockett. I was engaged in moving his household furniture from Crump's Bottom. As well as I can remember this was about the year 1899. It was moved on a boat; I hauled it out and put it on a bateau to go to Glen Lyn, and I went to Glen Lyn to haul it out. The furniture was loaded on one evening, and then the bateau left there that evening to go to Mercer's Salt Works. There was a load left for my wagon, and the bateau was supposed to go the next morning to Glen Lyn. I took the load to Glen Lyn and disposed of it, unloaded it on a platform and waited for the boat, but it never got there. I waited there until night for the boat to come, and it never got there. I stayed at the hotel and the next morning took the team and came down to see

what had become of the boat. It was under the Falls, Shumate's Falls, three or four miles from Glen Lyn hung up there. I hauled the Crockett furniture off the boat all day. I did not take all of the furniture off the boat. The next morning they got over
1963 the Falls with the remainder of the load I did not unload, and came up to Jimmie Johnson's, an eddy, about a mile of the Glen Lyn Station, and I unloaded it the next day.

I know of no local name for the eddy at Jimmie Johnson's house. I never heard of a place in the river called the Sand Bar but there was a place I could get in with a wagon. That is where Mrs. Laura Johnson lived.

When the boat arrived at Jimmie Johnson's place, I unloaded the balance of the furniture into cars that had come from Radford. I hauled the furniture from the boat to Glen Lyn and I loaded it on the car. I removed all of the furniture from the boat after it got there. Alf Merchant was in charge of the boat and he lived near the mouth of Lick Creek, but just where I could not tell. It was at Mercer's Salt Works.

The witness upon Cross Examination testified as follows:

I was born in 1879. Before I moved to Crump's Bottom I lived in about a mile of Pipestem Post-office in Pipestem District. That was about four or five miles, or maybe six or something like that from New River. I was sixteen years old when I moved to Crump's Bottom about 1895.

I am familiar with New River from Crump's Bottom to Hinton and from Hinton to Glen Lyn. Of course I have been up and down and have seen the river. I have been up and down several times. I have been up the river from Crump's Bottom to Glen Lyn. I have been in the road, but I have not been on the river up there. I have rode on a boat, but not up to Glen Lyn.

I do know about, or pretty near where Wylie's Island is. As well as I can remember Wylie's Falls was close to where there was an old mill, about the Dickerson place. I could not tell you how far it is from Glen Lyn down to Wylies Falls, but they always called it ten miles from Crump's Bottom to Wylies Falls. It is a right smart step.

I know where Shumate's Falls is, if I mistake not, Wylies Falls is below Shumate's Falls. I could not just tell how far below Wylies Falls is Wylies Island, but right in there somewhere (referring to Exhibit 185). I do not know how far Wylies Island is below Wylies Falls; I am not familiar with it. Somebody may have pointed out Wylies Island, but it was not enough to
1964 attract my attention. I could not come out and tell you how far Wylies Island is above Crump's Bottom. I have not measured it. Maybe I could make a guess.

A raft moving from East River to Wylies Island would pass Shumate's Falls and would pass Wylies Falls if Wylies Island is below the Falls, but I cannot say. I do not know much about the river where the Falls is. I know that there is such a Falls there, but just exactly where they are located and how many miles, I could not say.

I am more familiar with the river from Crump's Bottom to Hinton than any other way. I know practically all of the shoals between Crump's Bottom and Hinton. I do not know whether Bull Falls would be the most difficult shoal to navigate between Crump's Bottom and Hinton. There is some fall in that place but I don't know whether it is the most difficult. Bull Falls is not exactly perpendicular, but more so than the usual.

Q. I ask you isn't it a fact that at what you would call ordinary summer low water, a row boat or a skiff can be propelled up-stream through Bull Falls by one man?

A. How do you mean by "can be propelled?"

Q. Polled up?

A. Run with oars?

Q. I am talking about polled up.

A. You would have to be a pretty good hand with a skiff.

Q. It can be done with a man familiar with the channel and a man who knows how to propel a skiff?

A. I don't know. I have never seen one propelled up there. All those I have known have been polled up. I wouldn't say a man couldn't do it.

Q. As a matter of fact, Mr. Lilly, if there was any perpendicular drop there, a man couldn't do it, could he?

A. There is a perpendicular drop, but there is a chute cut through. You couldn't get it out of that chute.

Q. I am directing your attention to the channel through Bull Falls: There is no perpendicular drop in the channel there, is there?

1965 A. No, sir.

Q. And that channel is about 30 feet wide, or 50 feet wide?

A. I don't know exactly.

Q. As a matter of fact, they used to take steamboats through that channel, didn't they?

A. I don't know, but I have heard it.

Q. That was the reason the channel was cut 50 feet wide, so steamboats could go through?

A. The channel was cut up there.

Q. As a matter of fact, Mr. Lilly, do you know as to the number of keel bottom boats that operated between Round Bottom and Hinton during the late seventies and eighties?

A. Since I come to New River, there used to be bateaux, about the time I first come to the river.

Q. You came there in 1895, didn't you?

A. Yes, sir.

Q. They were still plying the river between Round Bottom and Hinton in 1895?

A. At the lower end of the bottom and at the end of the bottom at Mercer's Salt Works was where I think that they did most of the hauling.

Q. That was after 1895?

A. Yes, after I come to Crump's Bottom.

I do not know whether at ordinary stages, or even at low water, a boat drawing fifteen to eighteen inches had any difficulty passing Wylies Falls. I am not familiar with Wylies. I am not familiar with Shumate's Falls. There were a lot of men down below who were familiar with the river, but I do not know whether any plied up there. If there was any boating done up there, I know nothing about it.

I loaded the Crockett household furniture at the upper end of Crump's Bottom above Harvey Falls. To the best of my remembrance that was in 1899. I do not know whether it was one of Squire Peter's boats. It was on Alf Merchant's boat. We
1966 had a man who lived at Mercer's Salt Works named Squire Peters, but as to his running a lot of boats I do not know. I knew J. H. Peters or Bud Peters the son of Squire Peters, but I never knew of him running boats on the river. I never knew a colored man named J. R. Smith or a man known as Emmett Smith.

Alf Merchant, a colored man, was in charge of the boat that moved the Crockett household furniture up the river. They always said that Alf Merchant was the owner of the boat. I could not say for certain how many men were on the boat. They usually carried two and the head on those bateaux, and he had four or six, and he steered it himself. I loaded one boat with Colonel Crockett's furniture. I don't know the length of that boat, but the average bateau was about fifty to seventy feet long or along there. I could not remember just what articles we put on the boat, but they were articles at his house. There was not a full boat load, but furniture does not load up like lumber. I do not think any members of the Crockett family moved by the boat. I think I was there when the boat started up the river that evening. The best I remember, the boat put out and started up the river that evening.

Q. How many were there?

A. I think four or five.

Q. Give us the names?

A. Merchant and one or two of the boys. One was John and Jim, as well as I remember.

Q. J. R. Smith, the colored man, was not on the boat?

A. I couldn't say.

Q. Was Andy Medley on the boat?

A. I don't know. I don't know who the crew were. It has been too long to remember. Some of them I didn't know. I don't remember just who the crew were. They had a boat crew and an extra crew in shoving up the river.

Q. How far from the river did Col. Crockett live? In other words, how far did you have to move his furniture?

A. From where I moved it to load on the boat, something
1967 like three-quarters of a mile or a mile.

Q. How many wagon loads did you make?

A. I don't remember, but my remembrance is I loaded the boat one evening.

Q. Did you make four or five trips?

A. I reckon so.

Q. Probably ten?

A. I couldn't tell you how many trips, but I loaded the boat.

Q. How many trips did you make from below Shumate Falls to Glen Lyn?

A. I don't know, but what I could haul one day.

Q. You hauled all one day and part of the next?

A. No, not part of the next. I hauled part of the next after they got up over the falls.

Q. That is what I say, and if you listen to me I think we can get along: How many days were you occupied in moving the furniture from Shumate Falls to Glen Lyn?

A. 1 day and a half going and a day coming home.

The distance from Shumate's Falls where I unloaded the boat to the car was about three or four miles, according to what they told me. I don't know how many trips but I took right smart stuff on the boat. I do not know who assisted me in unloading the boat. Some of the boat hands, I think. Maybe Robert Crockett, but I just do not remember now who. There was only the one boat engaged in this enterprise.

The road from Glen Lyn down to the point below Shumate's Falls where I unloaded the boat ran right down the river, right across, we forded East River at one time from Glen Lyn down the river. There was a road down the west bank of New River from Glen Lyn all the way down to Shumate's Falls and below. It was a road you could come through with a wagon, but it was not much road, but there was a road down to Crump's Bottom. You could drive over the road with a two-horse wagon.

Q. How much was left on the boat after you had taken off a portion of the load at the time the boat went through Shu-
1968 mate Falls and landed at East River?

A. Well, I just couldn't tell you, but it must have been half unloaded and maybe more.

Q. About half unloaded?

A. Yes, sir. Of course I don't know exactly, but that is my remembrance. It was half unloaded. It lightened it up considerably what I hauled away. Maybe it was more.

Q. How long did you live at Crump's Bottom?

A. I have lived at Crump's Bottom, I don't know that I can tell you, but I lived in sight of it on the opposite side of the river ever since.

Q. You mean you live there now?

A. On the opposite side.

Q. You lived on New River?

A. Yes, sir, on the Crump's Bottom side, or on the forest hill side.

Q. Do you recall when the Norfolk & Western New River Division was constructed? That is the line that runs from Radford down to Glen Lyn, and then up East River?

A. No, sir; that must have been before I come to Crump's Bottom.

Q. That was before you came to Crump's Bottom?

A. Yes, sir.

Q. I ask you, Mr. Lilly, if it is not a fact that, as late as 1912, there were still a number of these keel bottom boats and bateaux plying New River by Hinton and the place you lived?

A. In 1912?

Q. Yes?

A. I expect there were.

Q. Do you know anything about the cargoes carried by these boats?

A. Well, they practically carried staves and lumber.

Q. And tobacco?

A. They never hauled no tobacco; no.

Q. You never saw any tobacco?

A. No. There was not any raised down about the Bottom since I have been there.

1969 Q. There was none being raised in 1895?

A. No, sir; not on the Bottom since I have been at Crumps Bottom.

Q. How about timber? Were they still operating above Crumps Bottom?

A. Yes, sir; there was timber cut in that country ever since I have been there, and is yet.

Q. That came down the river, some of it, in loose logs?
A. Yes, sir. They cut logs at Crumps Bottom.
Q. And some were rafted?
A. Yes, sir.
Q. And as you have stated, that was shipped by keel bottom boats?
A. Yes, sir.
Q. And cross ties?
A. Yes, sir; there were cross ties.
Q. Did you know a concern operating at Hinton by the name of James & Son?
A. Yes, sir.
Q. They cut an enormous amount of timber in that section, didn't they?
A. Yes, sir; I reckon so.
Q. And took it all down New River?
A. Yes, sir.
Q. Are you a relative of Bud Lilly?
A. Yes, sir.
Q. What is the relation?
A. Brother.
Q. Did he, or other members of your family, boat on New River?
A. Yes, sir; and there was another brother.
Q. What was his name?
A. Ed.
Q. He boated, too?
A. Yes, sir.
Q. And so did Bud?
A. Yes, sir.
1970 Q. Were you related to the Lilly family that was engaged in lumber operations on New River?
A. The Lilly Lumber Company?
Q. Yes.
A. We were related some, but I couldn't say how. It is distant.
Q. There was a Lilly Lumber Company operating in that community?
A. Yes, sir; at Hinton.
Q. When would you say, Mr. Lilly, that the greater portion, or the bulk, of the timber on New River between the Narrows and Hinton had been removed?
A. Well, I don't know anything much about the timber after you leave Crumps Bottom, when it was moved. Long after I come to the Bottom they moved it on all the time.
Q. Were they operating as recently as 1920 to 1925?
A. I don't know. There have been some saw mills in there; maybe, I think since that time.

There is no railroad between Glen Lyn and Hinton and the roads are not very good. We have a very good dirt road from where I live to Hinton, but in bad weather the road is almost impassable.

I have had no business transactions with the Appalachian Power Company and have never been in their employ.

By Mr. ABBOT. If your Honor please, I want to move to strike out that part of the cross examination of this witness which was not responsive to the direct examination and it was not a matter of testing his credibility. It seems to me that they are endeavoring to bolster up their own case by every witness that we put on, and it is improper now for them to make our witness theirs or to attempt to make our witness their witness.

By the COURT. I overrule it.

By Mr. ABBOT. We save the point.

The COURT. There is some basis for that, but as long as the evidence is in, I will let it stay.

The witness on Redirect Examination testified as follows:

The boat, after it went through Shumate's Falls, went to Johnson's—Jimmie Johnson's—is my understanding. It did not go to East River. That is just a little below the mouth of the East River. East River, you might say, is at Glen Lyn station. The Johnson house is on the left side just above the road and is something like a mile from Glen Lyn. The Bottom I have referred to was Crump's Bottom. I did not know very much about Round Bottom. Of course, I have heard them say that they would go up as far as Round Bottom. I have not been there to see them load, but they were supposed to.

1971 The witness, on Recross Examination, testified as follows:

The boat carrying the Crookett furniture landed something like a mile below East River. The mouth of East River is close to the station, and the boat landing was something like a mile.

JAMES ADAIR, SR. on Direct Examination, testified as follows:

I will be 59 years old the 4th of December. I was born just about a mile east of the Pearisburg Depot, on the north side of the river. I reckon I stayed there about a year, my father moved then to Kansas and stayed there about two or three years, and when I was about four years old we came back to Lurich, Virginia, what is now Lurich, Virginia, it was just a farm there. It had no name. That was about 1882 or 1883, I reckon. We lived at Lurich until I was about eighteen years old, then we moved two miles east of Lurich and lived there until I was, I reckon, 28 years old. Something like that, 28 or 29, and then I married and built a house and moved back to Lurich, and lived

there about two years, then I moved from there to Narrows and lived at Narrows the balance of the time.

I taught school four years, four or five months each. The first term was about six miles west of Narrows, up Wolfe Creek. The next year, the second term, I taught about three miles below Glen Lyn, near Shumate's they called the school house "Pig Tail," right in the lower end of the county. This was at Dr. G. A. Shumate's. Shumate's Falls is at the upper end of his farm. I taught school there in the fall and winter of 1898 and 1899.

I knew Col. John Crockett right well. He was at our house real often. He stopped there on his way to and from Radford. He was in the real estate business at Radford and stopped there real often.

Col. Crockett moved away from Crump's Bottom twice. The first time he moved away, I think it was in 1892, and at that time he moved by wagons, and my father had a contract for two teams and Mr. Spangler had a contract for eight teams, and we all went down the same day and brought him back; went down one day and came back the next, and loaded his stuff in
1972 a box car at Lurich. As I remember there were ten teams, some two-horse, some three-horse teams and some four-horse. My father I know had one four-horse team. In leaving Crump's Bottom all the teams did not come exactly the same way. My father with his team came up the river to Harvey's Ferry, the upper end of Crump's Bottom, and across there, and the other teams, if I am not mistaken, went down across the Ferry at Crump's Bottom and went up the other side of the river from there. We all came up the right side of the river. We did not come to Red Sulphur. We left Red Sulphur off to our left, something like four or five miles, we came up through what is now Bozo, they called it Chestnut Hill at that time, that is, coming this way, leaving Red Sulphur off to our left, something like five miles. We came into the road at Peterstown, hit the road from Red Sulphur about a mile from Peterstown. The first two teams that arrived there forded the river at Lurich, at the horse ford one mile east of Lurich, but by the time we got there, we got a late start, and the river had risen from a rain the day before, and we had to drive up the river two miles to Hobbs Ferry, and cross there, but these first two teams forded the river,

Col. Crockett moved again about the winter I taught down at Shumate's "Pig Tail" school house; in the meantime he moved back to Crump's Bottom. He moved back to Crump's Bottom in the spring of 1895 from Radford. In the year 1898, and if I

am not mistaken, it was in December, 1898, Col. Crockett moved back to Radford the second time. He moved from Crump's Bottom up to—he was aiming to go to Glen Lyn—they put his stuff on a bateau and pushed it up the river, trying to get to Glen Lyn, but did not get all the way to Glen Lyn. They got up to Shumate's Falls and worked there some time and could not get the bateau over, and they had a team along with them anyway, and they got another team from Mr. Shumate or Mr. Dickinson one or the other to help them move it from below the Falls to Glen Lyn. I would say that this was in December 1898.

One time I saw a fellow, by the name of Stuart, try to raft some chestnut oak logs down the river. The raft was built about two miles up the river above Narrows on the New River.
1973 I lived two miles down the river from Narrows, and by the time they got there the rafts were bursted all to pieces, and the logs floating all along the river, here and there, and some going on down. At that time I was living two miles east of Lurich.

I hauled staves awhile one year from down below Glen Lyn up to Glen Lyn. I think the staves were loaded on my wagon about a mile and a half from the river back on the hill above Round Bottom. We left Round Bottom and went directly about a mile and a half to the station. It would be hard to say how many people were engaged in hauling these staves, but there was about six or seven teams that would go together down in the morning and we would meet probably that many during the day coming from that country out, say fifteen teams a day down there. It was understood that these staves were for the Standard Oil Company. I was engaged probably two months in hauling these staves. I believe this took place in the year 1912.

The bateau that moved Col. Crockett's furniture was the only one I ever saw on New River in Virginia.

The witness, on Cross Examination, testified as follows:

I have lived at Narrows about twenty-seven years, well, not altogether. I moved back to Lurich a little while, about 1912. Narrows is about seven miles from Glen Lyn. Lurich is about two and a half miles from Glen Lyn. I am assistant Post Master at Narrows. I have never been employed by the Appalachian Electric Power Company.

Referring to the Stuart raft I suppose anyone would know it broke up on the rock in the river. I did not see when the raft broke, but I have seen plenty of rocks in the river. I did not see the raft break. I saw the raft before it left, and saw it down at my house, below the Falls broke up, wouldn't I know it broke up? I do not know whether Mr. Buckland saw the same raft as I did or not.

In 1912 I hauled some staves from the railroad at Glen Lyn, that is, on the Norfolk and Western. I hauled the staves from the mill about a mile and a half from the river, near Round Bottom. Round Bottom is in Somers County. I hauled the staves on a wagon about nine miles to Glen Lyn. This wagon road
1974 ran between the mountain and the river, just barely room for the road most of the way down there. I hauled staves over this road something like probably two months. That was all the staves I hauled along that road.

It is hard to say, when I first became acquainted with John Crockett, at that time he lived at Crump's Bottom and I lived at Lurich. He got in the real estate business at Radford, and going back and forth to Radford he always stopped at our house and usually some of his people would bring him up there, but when he wanted to go back my father would take him down to his place from our home. As well as I can remember Col. Crockett first moved from Crump's Bottom to Radford in about the year 1892. That was the time we moved him by wagon. Col. Crockett moved from Radford back to Crump's Bottom in 1895. I do not know who moved him from Radford back to Crump's Bottom, but he moved back by wagon.

Q. When did he come back up again from Crump's Bottom?

A. 1898.

Q. Is that the time he came on the river?

A. Yes, sir.

Q. Are you sure of that date?

A. Yes, sir.

Q. How do you fix it?

A. Because I was twenty-one years old that fall, lacked one month being old enough to vote in the election, when Teddy Roosevelt was elected.

Q. And Theodore Roosevelt was elected in 1898?

A. Yes, sir.

Q. Elected what?

A. President of the United States.

Q. The election was held in November 1898?

A. Yes, sir.

Q. Now as a matter of fact, in November 1898 Theodore Roosevelt was elected Governor of New York, was he not?

A. No, sir; he wasn't.

1975 Q. And in 1900 he was nominated with William McKinley on the Republican ticket?

A. I am not sure about the date. I have not looked that up.

Q. And McKinley was shot and Roosevelt first became President in September 1901?

A. I have not looked that up.

Q. And Roosevelt first ran for President in November 1904 and was elected President at that time, wasn't that the only time Roosevelt was ever elected President?

A. I have not looked up the dates.

Q. You say you know you made this trip in 1898 because you were not quite twenty-one, and could not vote for Roosevelt for President that year?

A. No, sir; I didn't.

Q. Isn't that the way you fixed this date of the Crockett moving, by Roosevelt running for President, that was the fact on which you fixed your date, wasn't it?

A. What time are you talking about?

Q. I am talking about the move on the boat in 1898.

A. That was in 1898.

Q. That is the way you fixed the fact of the date of his move?

A. Yes, sir.

Q. Now this was the boat trip he came up the river and you didn't go on that trip?

A. No, sir.

Q. You don't know of your own knowledge whether the boat stopped at Shumate Falls, do you?

A. Yes, sir; I know it.

Q. Were you there?

A. No; but I had evidence to know.

Q. You didn't see the boat stop there of your own knowledge?

A. No, I didn't.

1976 Q. You don't know how long it stopped, of your own knowledge, do you?

A. Well, no; not direct knowledge I don't.

Q. And you didn't move from the boat to where he went, did you, so that all the information you have given the Court was volunteered by you as second-hand information, from someone else?

A. You might construe it that way.

On this trip Col. Crockett moved from Crump's Bottom to Radford.

The witness, on Redirect Examination, testified as follows:

When I taught at "Pig Tail" school I was 21 years old that September. It was at this time that I saw the boat carrying Col. Crookett's furniture.

Q. Was there any physical evidence of the fact that the boat had hung up there?

A. Well I saw the tracks where they had hauled out of the bottom, come out of the bottom and turned to go up the river to Glen Lyn.

Q. What sort of tracks?
A. Wagon tracks.
Q. What did that indicate?
A. It indicated they had been hauling something from the river down there to Glen Lyn.
Q. The river where?
A. The river just below the Falls.
Q. From the river there through the bottom to the road?
A. Yes, sir.
Q. Were there many of those tracks?
A. Yes, sir; several of them, pretty well beaten down there.
Q. When was it you observed the wagon tracks after you saw the boat pass by the school house up the river?
A. It was on Friday afternoon, because Friday afternoon they always sent my horse for me, and I went home, and went
1977 up there, and didn't ride up any day but Friday.
Q. When was it you had seen the boat, how long before that time?
A. The boat was the day before, that must have been Thursday morning, something like ten o'clock in the morning, the boat went up past the school house.
Q. Was there a ford there?
A. No, sir.
Q. Was there a barn there?
A. No, sir.
Q. Was there any crop there to be moved?
A. If there had been they wouldn't have gone out the road, but come straight down the bottom.
Q. And were the wagon tracks—describe what the condition of those tracks was when you saw them on Friday afternoon?
A. They indicated the wagons had passed out of there during that day some time.
Q. Did you see any of that furniture being hauled away on wagons?
A. No, sir; I did not see any on wagons.
Q. In answer to a question I believe counsel said the first move was by wagon to Radford and the second move was by boat to Radford. Did you mean the boat went all the way to Radford?
A. No, sir. The boat didn't get up any further than Shumate Falls.

The witness, on Recross Examination, testified as follows:

Q. Mr. Adair, I understand you to testify now the boat didn't get up any farther than Shumate Falls. Do you want to stand by that statement?
A. As far as I know it didn't go any further.

Q. Do you know as a matter of fact after part of the furniture was taken off the boat went through Shumate Falls to Glen Lyn?

A. If it did I don't know it.

Q. You know all the other facts relating to this transaction, except that fact.

1978 A. I know they hauled this stuff out from there so why would the boat go on?

Q. I am asking if you know that fact, you taught school almost within sight of where this happened?

A. Within a mile.

Q. You saw the wagon tracks and know the incident, but you don't know the boat went on through Shumate Falls to Glen Lyn?

A. No, I don't know.

Q. Are you willing to swear you know it didn't?

A. Yes, I will swear to my knowledge I didn't know he had gone up there.

Q. Are you sure of that fact as any fact to which you have testified here this morning?

A. I had no way to tell or see or find out whether it had gone or not.

1979 N. A. KERSEY, on direct examination, testified as follows:

I will be 82 years old September next. I was born in Pulaski County, on Max Creek. I lived there until 1886, except 5 years during the war, my father moved to Claybourne County, Tennessee, and then moved back to Pulaski.

I hauled iron from the Radford Furnace, the Macks Creek Furnace. I had a team there in 1880 or 1881, and hauled iron from the furnace to Dublin. After I stopped hauling I went to work in a blacksmith's shop there at the furnace as a helper. I hauled ore from Hiawassa station over to the furnace. The ore came from up the river, what they called Clark's Ore bank.

The ore was brought down the river from Hiawassa in what they called keel bottom boats. The ore was then unloaded at Hiawassa station. I couldn't tell how many teams were engaged in hauling the ore. Some days there would be four and five, and sometimes not so many. It depended upon how much ore came down by the boats. Sometimes they could not get a day's hauling. I didn't know where the ore was loaded on the boats, I just supposed they hauled it from the ore bank down the river. I don't know how far the ore bank is from Hiawassa. I guess it is about a mile or a mile and a quarter or a half or something like that. I couldn't say. I stopped hauling because my team died.

I never saw any iron hauled on boats on the river. I didn't live right on the river, but it was rumored around the furnace there they were hauling some from the mouth of Macks Creek down to the New River Depot. I didn't see any, but it was reported there they were shipping some from that furnace down to New River Depot, but I never saw them loading any because I wasn't down there. The blacksmiths did some work for the boatmen when I was a helper there. They put some spikes on the poles used to push the boats. It was reported around on the works that they were shipping some of the iron from that furnace by boats down New River.

At that time iron was being hauled to the railroad by wagons.

I don't think they ceased hauling iron to Dublin, because
1980 five or six teams were hauling the same time I was. The iron I hauled I loaded at the furnace in my wagon and hauled it across the ferry to Dublin and unloaded it. There was a tram road to the ferry. That was several years before I hauled any, that road was a little tram road built down there, I reckon ten years, maybe, before I hauled any iron. They tore up this tram road and moved it away before I hauled any iron. They built a tram road down the river and pulled the little cars by mule and run the track in the ferry boat and pulled them out on the opposite side, and unloaded this iron on the opposite side of the river, and the teams would haul it to Dublin. They did that for a number of years, or for a year or maybe two years, and I don't know why they quit it, but they quit that and hauled it straight from the furnace to Dublin.

I quit the furnace in 1883 and went to Bland County. I moved to Bland County in the fall and moved back in the spring. I was there about four or five months. I came back in the spring of 1884. I got a job with Mills and Fairfax, sharpening steel to cut stone for the Hiawassa bridge. While I was living in Bland County the Radford or the Macks Creek Furnace went out of blast.

Q. Did it ever go in blast again?

A. Several years after I moved away from there, some fellow, so I was told. I don't know it to be a fact, leased that furnace, but I don't know about that.

Q. How long after was that?

A. I couldn't say because I was living in Pulaski then.

I left there in 1886 and the furnace was not in blast. The furnace was out in the fall or winter of 1883–84, or that is the way I have got it down in my recollection.

I cannot remember whether I saw any bateaux or keel boats on the river, besides the boats hauling ore from Clark's Ore

banks to Hiawassa. I might have seen some, yes, I have seen several boats around there, but I don't know just what they were doing. At this time the railroad might have started.

When I was sharpening steel, they were working on the railroad grade between Pulaski and Hiawassa Bridge.

1981 They were grading along there, and also grading some when they were cutting stone for that bridge, they were grading on the other side of the river in a big cut there, they were grading out that the same time they were cutting stone. That was in the spring of 1884. I could be mistaken, but I think I am pretty close to it anyway.

I can remember several of the people who were hauling iron to Dublin. Tom Silvers is the one who hauled the same time I did, and Ed Richardson and Ross Cecil, and Fatty Morgan, an old colored fellow who lived in Montgomery County, but he had a team there. I think a fellow by the name of Bill Ratcliff had a team and hauled a little while, I don't know how long, not very long. The company had some teams there but I don't remember any of them hauling any iron. They hauled charcoal from up in the mountains. I think most of the teams they had themselves hauled this charcoal from the mountains. I couldn't tell how many teams were engaged in hauling iron to Dublin, at the time I was hauling. Some days some of the farmers around there would haul maybe a little while and then lay off a while and drop in and haul again. They did not haul regular, I don't think. I expect there was some five or six teams that hauled the iron but some did not haul regular.

Q. Do you remember Son Whittaker?

A. He hauled iron way before I hauled any. The furnace was in blast there for several years before I commenced hauling any.

Q. Do you remember Henry Vance?

A. Yes, sir.

Q. What did he do?

A. He hauled iron but several years before I hauled any, he didn't haul while I was hauling.

Q. How about a man by the name of Rhodes?

A. Well, he hauled before I did.

I mentioned some of these names who were hauling at the time I was hauling, but there was a whole lot more who hauled before that, but I don't remember. I never paid much attention to them because I wasn't hauling.

1982 The witness, on Cross Examination, testified as follows:

I suppose the Radford Furnace is about one mile or seven-eight's of a mile up from the river, or something like that. I have heard how far it was, but I couldn't state exactly,—something like a mile. I couldn't say how far Hiawassa is

from the mouth of Macks Creek around that horse shoe bend I couldn't tell how far it was. It might have been four or five miles. I couldn't say, it might have been three or four, I don't know.

The Clark mine might have been a mile or a mile and a half from Hiawassa. The mines were not right on the river, the mines were back up on the hill away from the river, maybe half a mile. The ore was hauled from the Clark mines on wagons down to the river and placed on keel bottom boats. The ore was loaded above Hiawassa, and transported down New River to Hiawassa. The ore was then taken by wagon across the hill over to the Radford Furnace.

After the pig iron was manufactured it was transported back to the river, but not to Hiawassa. The iron was hauled from the furnace to Dublin by wagon. The wagon and iron were taken across the river by ferry. I believe the distance from the furnace to Dublin was ten miles. There were some small hills to go over and some of it was a pretty heavy pull. When it rained we had bad roads in those days. In one day's work, it was all a fellow could do, to haul a load from the furnace to Dublin and back home. I used a two-horse wagon and carried a ton of pig iron, or 2240 pounds, they put a long ton on. My recollection is that they paid us $2.50 per ton to carry it to Dublin.

Q. Now you say it was your understanding that some of the pig iron which was manufactured at the Radford furnace was hauled down to the river, placed on boats there and carried to New River Depot on boats?

A. That was just a rumor, just talk around the furnace that they were shipping some by keel bottom boats to New River depot.

Q. How far was that?

A. I don't know how far it was.

Q. Have you ever been down the river to Radford?

A. Not by the river, I haven't.

1983 Q. Now do you know anything about the operation of the Boom Furnace?

A. No, sir; only except by hearsay.

Q. It was operating in those days, wasn't it?

A. It did operate but I don't know what date it was, it was operating, I think, about the time I was working there at that Radford Iron plant.

Q. And it was located about the mouth, or somewhere near the mouth of Reed Island Creek?

A. It ran up the creek a piece, but I don't know how far it was.

Q. How far up the river above Macks Creek?

A. I couldn't tell you. I would have to guess at it.

Q. What would be your best proximation?

A. You mean Macks Creek?

Q. No; I mean from Macks Creek to the mouth of Reed Island Creek?

A. Around the river?

Q. Yes, sir.

A. I would say it was 10 or 12 miles, just guessing at it, I don't know for sure.

Q. You also understood, did you not, in those days, that the pig iron which was being manufactured at Boom Furnace was being transported down the river in keel bottom boats to New River depot?

A. That is my understanding that they were doing that, but I don't know it to be a fact.

I don't remember anything about the Barren Springs furnace, I mean I don't know whether it was in blast, or not. I have been up the river on the train and have seen Foster Falls. That is up almost to Ivanhoe. Foster Falls is above Macks Creek and Boom Furnace. They commenced building the Macks Creek Furnace or the Radford Furnace in 1867 I believe, or 1868, according to my recollection, just a couple of years after the Civil War.

Q. Is it your understanding that it operated constantly from 1867 to about 1883?

A. I don't know, but they were idle several times.

1984 Q. Just for short times?

A. Yes; and it might have been idle a time or two for a year or two, I couldn't say.

Q. In those days there was no way for the pig iron which was manufactured at Macks Creek furnace to be moved to the railroad, either to Dublin or New River Depot, except by boat down the river, or by wagon across these mountain roads?

A. I don't remember at that time when it was built, I don't think there was anything said about boating it, but they were hauling by wagon.

Q. I mean from that period on up to the time it went out of blast in 1883, there was no railroad up New River above Radford at that time?

A. No, sir; no railroad closer than Dublin.

Q. As a matter of fact, could you tell us when the first train went to Ivanhoe on the Cripple Creek Branch?

A. No, sir; I can't tell you.

Q. It was after 1884, was it not?

A. Yes, sir.

Q. It was in 1885 or after that, or up certainly until 1884 and the products of these furnaces either went to the railroad at Dublin or Radford by boat or by wagon?

A. There was no way to get it from over there except by wagon, from that furnace.

Q. Or by boat?

A. Or by boat. They hauled the materials to build the furnace on wagons from Dublin over there.

I can't say when the Boom Furnace commenced operation. I remember being up there shortly after they built it, but I couldn't tell you when it was. I think the Boom Furnace was in operation at the same time the Macks Creek Furnace was in blast. I couldn't tell you how long the Boom Furnace continued operations. Sometimes it would be in blast and sometimes I would hear the
1985 report that it was not in blast, or that it was idle, or something like that. I couldn't say whether there was a depression about the year 1884 or 1885 that might have caused the furnace to be idle. I don't know why they went out of business.

I have seen keel bottom boats and would guess them to be about 35 or 40 feet long. I don't know whether there were any keel bottom boats owned by the Boom Furnace and the Radford Furnace. I don't know they owned any. I never heard them claim they owned them.

I don't know who was supposed to boat this iron from Radford Furnace down to New River Depot. I never saw them loading it, and I can't remember the men that were accused of boating it down the river. I knew some of the men that boated, though.

Watts Odell, sometimes he was up there in the shop, and Clabe Lawson and James Evans Owen, just men talking around there, and I would hear that they were the crew doing the boating, among others, but I didn't see them boating any. I don't think they worked for the Radford Iron Company. I don't know who they worked for. I think they did most of their hauling from the Boom Furnace, but I don't know who they were working for or who paid them. I guess the company paid them who was handling the iron shipped, whoever it was.

The output of the Radford Furnace I might say was 10 or 12 tons in 24 hours. I think they operated with one grade of iron at one time and I heard a foundryman say that made 35 tons out of a certain kind of ore in 24 hours, if that was when ore was mined right there at the furnace, but that mine gave out and they had to use ore from Clark's Ore Bank and Reed Island. They hauled some from Reed Island down there.

While I was sharpening steel to be used in cutting stone for the building of the Hiawassa Bridge the stone was cut right close to

the quarry and hauled down to the bridge. That was in 1884. The quarry was up back of Allisonia, about two miles. At that time they didn't move the stone from the quarry to the bridge site by boats. They didn't finish that bridge or that abutment there the first year when they started it, but a year after or maybe a year and a half after is when they finished the bridge. They got the stone up above the mouth of Reed Island from Howard's Quarry and boated it from there down to finish the bridge at Hiawassa, they brought it from Howard's Quarry above
1986 there, and I sharpened steel to cut the stone up there too.

I think they were about a year and a half on that bridge after they started it the first time. That was about the year 1886, I reckon. They boated that stone from John Howard's Quarry, about the mouth of Reed Creek or above it, they boated it from there down to finish up these abutments at the bridge. I couldn't say how far Howard's Quarry is from the bridge site, a couple of miles or three miles, just guessing at it.

The witness, on Redirect Examination, testified as follows:

The stone was boated from Howard's Ferry down to the bridge site, they cut it up there most of it.

My understanding from the transaction of the business there at the furnace was that boating the iron was not successful there at that time. Because they had to haul it from above the river on wagons and they loaded it on the boats, and hauled it down to New River, and then haul it on wagon from there to the Depot, to be loaded on the cars, and it was too expensive.

J. J. Culbertson, the lessee or superintendent of the furnace on one occasion went away to New River because he said they got his iron mixed up down there and he had to go down and straighten up some iron which they got mixed up on the yard, but whether it was mixed up with their own iron, the different grades of their iron or whether it was mixed with the grade of iron that was shipped from Boom Furnace, I don't know.

I couldn't say what the capacity was of the Radford Furnace or Macks Creek Furnace. While I worked there I understood they were making from 6 to 10 or 12 or maybe 14 tons, depending on how the furnace worked. Sometimes it worked bad and they couldn't get much out of it, and then they would go to work again and make a little more. I couldn't say what it would average.

H. PALMER ROBERTS, on Direct Examination, testified as follows:

I will be 87 years old the last day of September. I live at 229 Day Avenue, S. W., Roanoke, Virginia. I lived on New River above Hinton at Pack's Ferry. We owned Pack's Ferry.
1987 We bought Pack's Ferry in 1882. I spent seven years there, and in Hinton and at Red Sulphur.

In the year 1882 or 1883, I am not sure which, I attended a sale of some boats in Hinton. I didn't pay much attention to it and I didn't intend to buy a boat anyway, but some folks were there bidding on it. The Government was selling out the equipment—the bateaux used in the construction of the improvement. I bid on one. I happened to be there; I thought somebody would bid. There was a crowd there and I thought somebody had been drowned. I went there and I didn't know anything about boats being sold, but when I got there, they were selling them and the auctioneer was selling the last boat. He had already sold two before I got there. A fellow ahead of me bid $10, and I didn't want to buy the boat, but I didn't think he ought to have it so low, and I bid it up 50¢, and he bid on it and I thought I would run him up to $25 or so, although I didn't need it, and didn't want it, but when I bid $12 he quit bidding and so it fell in my hands. I got caught on the trick. I was at Hinton and the home farm was four miles up at Pack's Ferry, and I couldn't leave it there in Hinton. I paid four men to carry it or row it home. I takes four men to run a bateau and they charged me 50¢ a piece and it cost me $2 to get it up there.

The boat looked like it was in first class condition. That is, the man, when it was offered for sale, said it was practically brand new and it cost $125.00, and it was new because the paint inside of the boat was not even stained with mud, and in fact, they never used it. It was bought too late to make any use of it and then the appropriation gave out.

I was clerking for Mr. Riffe after that and I left the boat at home, and they used it on one trip load with hay, going to Hinton, 4 miles, and that was the only trip we made with it. We found it too expensive to fool with the boat, when we found that a two or four-horse team could make the round trip quicker than we could bring the boat back from Hinton to our home at Pack's Ferry. It takes about three hours to carry an empty boat home and we could make the round trip with a team in one hour.

The mouth of Bluestone is on the west side of the river about three-quarters of a mile below Pack's Ferry. Our land
1988 extended a mile and a half down the river on the east side of the river. The location of Pack's Ferry was not changed after I left there. There was no use to change it. You couldn't make a road anywhere else, except in that particular place, because there was a gap on the west side where the road went into Raleigh County, whereas all on the north and south of that particular place, on the west side of the river, the mountain was steep and there was no place for a road. The mountains came down to the river on the west all the way from Bluestone to Hinton. From Pack's Ferry up to Bluestone, there is a path and that is all there

is and that is thrown up on the side of the mountain, because there is no place down there for a path of any kind in times of ordinary high water, and I guess that path was made there hundreds of years ago, because there is no path immediately on the river, because there are no flat places there in high water.

The witness, on Cross Examination, testified as follows:

My farm is on the east side of New River and Bluestone Creek is on the west side. It is four miles from my farm down the road to Hinton. It was a good road. The road was frequently traveled, it was the only road. There were roads leading to Greenbrier from the upper section of Monroe County, and so on, but that was the only road leading into the valley of the New River, because we couldn't have any roads on the west side, because being up in the mountains that came clear to the water. The road went up the river to our place. Of course, there were little variations, that is, the mountains and hills made the road turn some. My mother owned Pack's Ferry and we operated it ourselves.

We used a flat bottom boat on the ferry. Wagons and horses were carried on the boat. We carried all that traveled that particular road; that branched off from the road to Hinton that went into Raleigh County. We went to Hinton and all over into Raleigh County and Beckley and down towards Charleston. I suppose all of the dwellers and inhabitants of that region who had to cross the river would use Pack's Ferry to cross and
1989 drive down to Hinton. We hauled all the travellers who used the road to Raleigh County and to Beckley. A great deal of cattle was ferried across there from that county to Monroe County, where they had blue grass. I don't know whether there was any farm produce hauled, because those people had some other market I imagine. I couldn't say as to everything that was ferried across there, because we had a ferry-man and it was his business to ferry everything. I rode across on the ferry boat occasionally.

I attended the sale of the Government boats at Hinton. I bought the last boat that was put for auction. The boat I bought was about 50 feet long, and I don't know exactly the distance from side to side, but I imagine something like 8 or 10 feet. They were keel bottom boats or what was known as a bateau.

Q. You are familiar with the bateau type of boat, are you?

A. Yes, sir.

Q. You have seen them on the river, have you?

A. I could not tell you; I seen them going past, but I could not describe the boats going down the river, loaded with probably staves or something. I would only see the load, it is probable.

Q. You have seen bateaux going down loaded with staves, have you?

A. Yes, sir.

Q. As a matter of fact, bateaux moved back and forth past your place right often, did they?

A. Yes, sir.

Q. There was right much traffic on the river in bateaux in those years, wasn't there?

A. In certain lines of commodities, there was.

Q. What were the commodities?

A. Principally, almost exclusively, staves for making barrels.

I never saw them loaded with cross ties. I had no occasion to make the acquaintance of any of the men that operated these bateaux. I never saw the Government boats till they were offered for sale. I knew that the Government had dredged the channel, but the dredging and improvement was done prior to my
1990 arrival on the banks of the river. I couldn't say how long it had been since the Government ceased work; I know nothing about that; I never saw them at work. All the work where we lived was completed before we got there.

I found that I could drive a horse and wagon from my home down the east side of New River to Hinton faster than I could in a boat going down and coming back. The difficulty was in the time that it took to bring the boat up the river.

Q. How fast could it go down?

A. I don't know how fast the water carried the boat at all.

Q. You did not time it?

A. No, sir; I did not time it, but I know it took us longer to bring it back empty—at least it cost me more money to run it down there.

Q. What did you do with your boat?

A. I left it at home, tied up to a sycamore tree and at the time we moved away from there, I was doing business in Hinton with Mr. M. A. Riffe, who was a wealthy man there running a grocery business and he turned the grocery business over to me to go into the bank, and I never paid much attention to what the people were doing at home, and they did whatever they wanted to do with it.

Q. Well, what was done with it?

A. I don't know, because I gave it up and I didn't care what became of it, and I imagine, though I am not sure, that when we sold the farm to a man named Wycliffe, I think was his name, there from above Union, probably my father in law let him take possession of the boat along with the other things.

Q. So you never did sell the boat?

A. I don't know. I never sold it.

Q. You never sold it?

A. No, sir.

Q. And so far as you know, you just took it back to the farm and the boat was never sold, so far as you know?

A. No, sir; I don't know. I didn't feel interested in it, for one thing, because every time I had anything to do with it, it
1991 cost and I got shed of it as soon as I could.

Q. It was a great incumbrance and embarrassment to you?

A. Yes, sir; certainly; I was in the mercantile business and not a boatman.

Q. I had not asked you why you had not kept it, or why you were interested in it.

A. What is that?

Q. I say I did not ask you anything like that. Why did you volunteer the statement that you didn't care to have the boat and that it did not interest you and you didn't want it?

A. Because it cost me $2.00 an hour after I bought it, and I kept it awhile and made one trip and found that it cost more money to make a trip on the boat with our produce than it cost to go with two or four horse wagons to Hinton, and there was no use to be hauling down the river when we would have to hire people to bring the boat back and we had our own hands who were acquainted with horses and wagons, and they did not know a thing about boating, so every time the boat went down, we would have to hire hands to bring it up.

Q. The people at your place did not know anything about boating?

A. No, sir.

Q. And you did not either?

A. No, indeed.

Q. And you had to hire a boatman?

A. Yes, sir; every time we brought the boat from down there, we had to hire them.

J. B. TALBOT, on Direct Examination, testified as follows:

I was born in Floyd, August 5, 1858. I left Floyd when I was fourteen years old and came to Rockford. Rockford is down the river below Radford, on the west or left side, going down. I liver there two years. Then we moved to a place in Montgomery
1992 County, where we lived for about twelve months. It was between Gap and West Mountains. From that place, I moved to Pepper's Ferry, where I lived about two hundred yards from the river for eighteen years. When I lived at Pepper's Ferry I boarded with the man I worked for. His house was two hundred yards from New River. His farm I worked on was located right along New River. From Pepper's Ferry, I moved to Radford where I lived about two years. After that, I moved to Back Creek in Pulaski County.

Q. When you lived at Rockford, did you ever see any bateaux or keel boats on the river?

A. I seen one just a few times—just a few.

Q. Do you know who was operating the boats?

A. The one I seen I knew who was operating it—Beverly.

Q. What Beverly was that?

A. It was Sylvester Beverly.

Q. Did he have anybody else on the boat with him?

A. He had four men there pushing it.

Q. And approximately how many times did you see that boat when you were living at Rockford?

A. I could not be positive, but it was not over four or five times, anyhow.

Q. It was not over four or five times?

A. No, sir.

Q. After you lived at Pepper's Ferry awhile, or while you were living at Pepper's Ferry, did you ever see any keel boats or bateau on the river?

A. No, sir; not ever; I never saw none until when I was in Rockford.

The witness, on Cross Examination, testified as follows:

Q. Rockford is below Radford on New River, is it?

A. Yes, sir.

Q. How far down the river from Radford?

A. A mile.

Q. A mile?

1993 A. Yes, sir.

Q. That would be somewhere in the vicinity of the upper horse-shoe, would it?

A. Yes, sir; a good piece from the horse-shoe.

Q. Was it below the horse-shoe or above it?

A. Above it.

Q. And you say you were there about 1872—is that about right?

A. I reckon so; I never kept no date of it.

Q. And you were there two years?

A. Yes, sir.

Q. And while you lived at Rockford, you saw these bateaux and keel bottom boats going up and down the river?

A. Yes, sir.

Q. Who owned the boats?

A. The manager of it was Beverly.

Q. And you say that he had four men poling the boat?

A. Yes, sir.

Q. Did you know any of these men?

A. No, sir; I did not; I only knew him; I was acquainted with him.

Q. Was he a white or a colored man?
A. He was a colored man.
Q. How old were you then—were you about 14 years old?
A. I come to Rockford when I was 14 years old.
Q. Do you know whether or not these men on the bateau blew a bugle as they came up and down?
A. Yes, sir; they always carried a bugle.
Q. Would they put into your place and get produce?
A. No, sir; they just passed on.
Q. They never stopped at your place?
A. No, sir.
Q. Did you ever hear them blow the bugle?
A. Yes, sir.
1994 Q. And you saw them take the boat both going up the river and afterwards when they came down, did you?
A. I did not see them go down. They would go down at night. That is when I heard the horn, but I did not see them.
Q. Oh, they travelled by night as well as by day?
A. Yes, sir.
Q. At that time, there was no railroad down at Glen Lyn, was there?
A. No, sir; there was no railroad then.
Q. There was no railroad between Glen Lyn and Radford, was there?
A. No, sir.
Q. And there was no railroad below Glen Lyn until you got to Hinton to the C. & O. Railroad?
A. No, sir.
Q. Do you know what these men carried on these keel bottom boats?
A. No, sir.
Q. You never did see?
A. No, sir.
Q. That was about the only way, wasn't it, up and down the river, to get your produce, by the keel bottom boats?
A. And with wagons.
Q. The roads were very very bad in those days, were they?
A. Yes, sir.
Q. Can you tell us anything about the size of the boats?
A. No, sir; I never paid any attention to them.
Q. Did you ever see any logging done in that territory at that time, or was that before they started going on New River?
A. Before they started it?
Q. Yes?
A. Yes.

Q. Were you living at Pepper's Ferry when the Norfolk and Western cut-off was constructed—do you know what I am talking about—the cut-off across Pepper's Ferry?

A. Yes, sir?

1995 Q. Were you living there then?

A. Yes, sir.

Q. There was a lot of boating done in connection with the building of that bridge there, wasn't there?

A. If so, I did not see it.

Q. They had a steamboat in there, didn't they?

A. I never saw a steamboat.

Q. You didn't see a steamboat when they were constructing the cut-off at Pepper's Ferry? You say you never saw it?

A. Yes; I never saw it. If it was there, I did not see it.

Q. You were at Pepper's Ferry at the time, were you?

A. Yes, sir.

Q. How close did you live to the river?

A. The house that I boarded at was about 250 yards.

Q. And you had the same opportunity then to observe the steamboat, if it was there?

A. Yes, sir.

Q. (Continuing.) That you had to observe keel bottom boats, of they were going up and down the river?

A. Yes, sir; if there was a steamboat there, I did not see it.

Q. And you never saw the steamboat or the keel bottom boats?

A. No, sir.

While I was living at Pepper's Ferry I would be at New River Deport two or three times a week. I never saw any pig iron on the shore or in cars at New River Depot. I did not see anything shipped coming on the water there. I saw no pig iron. I traveled the road between Pepper's Ferry and Dublin, it was where the state highway is now. The distance from Pepper's Ferry to Dublin was about 10 miles. The Pepper's Ferry cut-off was constructed some time after the Norfolk & Western was built down New River from Radford to Glen Lyn. I can remember when they were building the cut-off on the Norfolk & Western.

1996 The witness, on Redirect Examination, testified as follows:

I was talking about the road from New River Bridge to Glen Lyn. The only boat I ever saw was the one operated by Sylvester Beverly. I knew him. He came from Floyd.

WILLIAM INGLES on Direct Examination, testified as follows:

I will be 59 years old my birthday. I have lived at Radford since 1908, before that, I lived at Ingles Ferry. I am a nephew of Captain William Ingles.

Q. Do you remember an alleged steamboat that was built at Radford?

A. It was built at New River, I reckon, across from Radford.

Q. Do you remember such a boat?

A. Yes, sir.

It was a heavy boat with an engine, an upright steam boiler. I think the boat was built by a fellow named W. C. Hodge. I remember the boat being operated up there, I have been on it. The boat had made several trips down between New River Bridge and Ingles Ferry. Ingles Fery is about three miles up the river from New River Bridge. They didn't seem to be able to get over Ingles Ferry—the Ingles Falls, and I have been on the boat when it would operate and get possibly two-thirds of the way through the falls and come to a stand-still and wobble and beat on the rocks and the engine paddle-wheel was damaged and they would draw it back. My father got interested in the boat, trying to get it over the falls. He practically wasted a whole summer's time trying to get the boat over the falls. I don't think they ever got over the falls, not to my knowledge. The attempt was made several times. I never saw any produce or supplies of any kind on the boat.

The witness, on Cross Examination, testified as follows:

I am the active vice-president of the First and Merchants National Bank at Radford. I have been connected with the bank for 36 years. That bank has no connection with Appa-
1997 lachian Electric Power Company. I was born at Ingles Ferry on New River. That ferry was named for some of my relatives. The ferry at first was operated by the County of Pulaski; it is operated at the present time by my mother. I would say that the ferry has been operated continuously since about 1760. Business on the ferry at the present is very light. The ferry is just below what is known as Ingles Falls.

Q. You say that you made, or attempted to go or get a boat over the Falls—over Ingles Falls?

A. I was in that boat when it attempted to go over there; yes, sir.

Q. Have you ever gone over the Falls?

A. No, sir; I never did.

Q. What year was this?

A. It is hard to fix the time. I would say about 1893, to guess at it.

Q. You know, don't you, that a great many boats have gone over the Falls?

A. Of various sizes; yes, sir.

Q. You also know, don't you, that iron has been carried in boats down the river to New River and from above the site of the Falls some miles above?

A. That is a little too early for me to state that fact. I saw boats go down, but I don't know what they were loaded with.

Q. You saw boats come and go, didn't you?

A. Yes, sir.

Q. They came from some place above Ingles Falls, above there, didn't they?

A. Yes, sir.

Q. They came from near the mouth of Mack Creek, didn't they, or Allisonia?

A. That is my judgment; yes, sir.

Q. Have you ever seen them at New River Depot or Bridge?

A. I could not say I have. I have seen them pass home when I was at Ingles Ferry.

1998 Q. You have been to New River Bridge quite often, have you?

A. Not at that early date, at my age.

Q. How old were you then?

A. I was five or seven years old.

Q. You were not over four or five miles from the Bridge, were you?

A. I have been there many times later on, but not at that time.

Q. How long did you live at the site of this Ferry that you speak of?

A. I left there when I was 22 years old.

Q. What time of year was it that you say you could not get the boat through the Falls?

A. It was in the summer season.

Q. In low water season?

A. Yes, sir.

Q. And there have been times when there was much higher water than that in the river—in New River?

A. Yes, sir.

Q. Would you say, in the summer season, say July at the present time, that it would be possible for a boat to through Ingles Falls?

A. It would be mighty hard to get any sized boat through there.

Q. Did you make your trip, or attempted trip, through the Falls in July?

A. I could not tell you. It was in the summer season, though I know that.

Q. What was the size of your boat?

A. This ferry boat there—the steam boat—oh, I don't know how to describe it, but it was a pretty heavy boat.

Q. I am talking about the length and width, is all.

A. I will say it was not less than 40 feet long.

Q. Now, you say you could not get your boat through there and your father could not get his boat through there.

A. It is the same boat that I am talking about—it is the
1999 Hodge steamboat.

Q. A large steamboat?

A. No; I said the Hodge steamboat.

Q. After having lived on the river practically all your life, you know that boats have passed up and down the river through Ingles Falls, carrying various kinds of commerce over quite a long period of time?

A. Yes, sir.

By the COURT:

Q. How long did they keep the steamboat around out there?

A. My knowledge of it was just the summer that my father took hold of it and was working on the paddle wheels most of the time—just one summer.

Q. What did they use it for—excursions and as a pleasure boat?

A. They would have used it for that if they had made a success of it, but it was not a success.

By Mr. WILLIAMS:

Q. What kind of a boiler did the steamboat have?

A. An upright steam boiler.

Q. Do you know whether or not the boiler and engine were adequate for a boat of that weight?

A. In my judgment at this time, I think it was rather light for it.

This was the Hodge boat. I think it was built at Hodge's plant at New River. It is located just above the railroad bridge across there at Radford. I don't know what became of this boat when they got through with it at Ingle's Ferry.

I know when the Pepper's Ferry cut-off was constructed for the Norfolk & Western Railroad. I know nothing about the steam boat being run there at that time.

I own no stock in the Appalachian Electric Power Company. My sister owns five shares. I think none of the officials in my bank own any of that stock. They may have a few shares. The bank owns none.

WILLIAM R. GERALD, on Direct Examination, testified as follows:

I live in East Radford. I am a retired Norfolk & Western engineer.

2000 I am seventy-two years old and was born in Giles County, on New River, a mile west of Eggleston Springs. I lived there until I was seven years old and then moved to Montgomery County, about a mile away from Walton and about one mile from New River. I lived there until I was fifteen years old, at which time I went to work on building the New River Railroad.

While I lived at Walton we did some farming on the New River bottom lands in Pulaski County. We farmed these bottom lands for several years and would ford the river in the morning and at night in a wagon. We were able to do this whenever the occasion required and we never had any trouble.

Q. Did you ever see any keel boats on the river, Mr. Gerald?

A. Well, I did see one going down the river.

Q. When was that?

A. That was along in 1875, when I was a boy working on the farm.

Q. When you were 15 years old, you say you went to building that railroad?

A. Yes, sir.

Q. What railroad are you talking about?

A. From New River Depot to Pocahontas.

Q. That is now the New River Division of the Norfolk & Western?

A. Yes, sir.

When I first began my work consisted of grading and laying ties and iron. I worked on this grading down at the tunnels at Eggleston before we laid ties. I was working for Mills & Rowland. When I laid the ties I worked for Buck, Crocker, Thomas, Butler & Dyerle. They were railroad company employees at the time. The contractors prepared the right of way and the Norfolk & Western laid the tracks. The first grading I did was done down at Eggleston. I continued at this until sufficient grading had been done so that they could commence laying iron from New River. Then I started to lay the iron and ties, which work was begun at New River Station and continued on until we reached Pocahontas on March 10, 1883. I was employed in that continuous operation from New River Station to Pocahontas.

2001 When I was grading at Eggleston I stayed in a shanty up on the hill there. I fed myself and did my own cooking. There was a commissary there which was supplied by wagons

from New River Depot. Old man Robey was one of the men who drove these wagons.

I didn't see any boating to the commissary at Eggleston. There was nothing boated there.

When we were laying the steel on the railroad we had a string of camp cars and in one of those cars was a commissary which furnished us everything we wanted. They moved it right along up. Every time we moved we would lay a couple of miles of iron and we moved the camp car up with us.

The camp car was supplied with provisions by a material train which brought all kinds of iron and fish plates, and bolts and spikes and such as that; it supplied us all the way through. During that operation I never saw any supplies, commissary or railroad supplies, boated on New River. After I had laid the tracks to Pocahontas, I went to braking under a man by the name of Butler. That was on the railroad between East Radford and Pocahontas. I continued to work there for about a month or so, I suppose. After that they gave me a job of firing a work-train on New River, between New River Depot and Glen Lyn, Engine 37. I continued to fire on that train until the 13th day of March 1884, when the mines exploded in Pocahontas and killed 164 men, then things ceased a while. After that I came over to Central or Radford and fired extra a little while until they got things straightened out. I stayed over there until the 1st day of September, 1886. I was then promoted to an engine the first day of September, 1886. I ran the engine then for five years between Radford and Pocahontas.

The railroad in the beginning from New River Depot to Glen Lyn followed the river all the way down to the mouth of East River, known as Glen Lyn, and there we turned up East River. After I left New River Depot we struck New River at Back Creek, in Pulaski County. That is about three or four miles below Radford on the river. They moved the station down nearly on the river. It went over what was known as Schooler Hill.

2002 In 1899 they changed the road and cut through by Walton, and went by the Eskridge Farm, and cut a tunnel down there nine-tenths of a mile long and cut off that hill where we used a pusher. I ran as an engineer on that Division for five years. After that I took a passenger run on the 1st day of April, 1890 and ran it for 37 years up and down New River.

I never saw any trade or travel on New River, but I saw flat boats ferrying wagons and things across the river, and canoes up in the river—people fishing. I never crossed the river at Dry Branch. That is where the Giles-Montgomery County line is. The river at Dry Branch is about three-quarters of a mile wide. I have seen people out there fishing in them little rippies standing on the rocks.

Belspring is about four miles from New River Station. It is just below the point where New River Railroad hits New River after leaving New River Depot, down at Back Creek. After leaving New River Depot, we went up over Schooler Hill, and they had a station up there called Schooler, and it was about two miles from there to Belspring. Belspring is down the river from the point where the railroad used to leave the river. The railroad did not hit New River before you came to Belspring. It is about a mile below there at Back Creek. They had a long trestle. That part of the railroad now has been abandoned. The cut-off from Walton through the tunnel is there.

The witness, on Cross Examination, testified as follows:

I didn't work on the construction of the Norfolk & Western Railroad down at Pepper's Ferry. I was not down there when they built the tunnel. They did use boats on the river in hauling material for constructing the tunnels. I know that they hauled their sandstone from Walton Quarry. It was loaded on flats and brought to Schooler and unloaded on the ground and hauled by wagons down to Pepper's Ferry, and boated down to the abutments. I don't know whether it was a steam boat or not. I don't know anything about that.

When I was about 15 years old I worked on a farm and we forded the river in wagons, night and morning. I suppose the deepest place in the river was about three feet deep. I am
2003 positive it was not four or five feet deep. It might have been a little deeper, but I don't think it was so the water ever got in the wagon bed. I had stated before in a deposition that the lowest depth at that place was four feet. I was of the opinion at that time that the lowest depth was four feet.

Q. Didn't you say, at that time, you could cross it only at low water, and at high water you could not cross it?

A. No, sir; and you will not find it on that report.

Q. You didn't say it?

A. No, sir; it is not on there, and, if it is, I didn't say it.

Q. Did you used to see boats going up and down this river?

A. When—at what time?

Q. At any time?

A. No, sir.

Q. You never saw one?

A. I saw one boat go up or down, I don't remember which, when I was small, about ten or twelve years, when we were farming and ploughing corn there in the Pulaski bottom.

Q. Just one boat?

A. That is all.

Q. On what occasion?

A. I might have saw two, that has been a long time ago, and I didn't retain it in my mind.

Q. Where was this boat, and what did it look like?

A. It looked to me like it was about 50 or 60 feet long, going down the river, with one man sitting on the rear end, with an oar, and two or three darkies on it. They might have been white men, I don't know.

Q. Go ahead, describe it? [Pause.] Can you describe the boat?

A. No; I don't know that I could. It looked like a keel bottom boat. I don't know whether I saw more than one or two.

Q. Did you see what it had on it?

A. No, sir; I was not close to it.

Q. That is the only boat you ever saw, and the only time you ever saw a boat on the river?

A. That is the only time I ever saw a boat going up or down the river.

2004 Q. Were not you asked this question in your deposition at Radford: "Now, state whether or not you have ever seen any bateau on the river?" and didn't you answer "Yes, sir"?

A. Yes, sir; I certainly did.

Q. Let me read this question and answer: "Describe those boats?" Didn't you answer "The boat looked to me like about 60 feet long, and four men in it polling it up and down New River"? Did you say that?

A. Yes, sir. I don't think I saw but one boat going down the river, and I saw one coming up the river.

Q. That is two?

A. It might have been the same boat coming back; I don't know.

Q. Was it near enough to you?

A. The reason I saw the boat, they had a bugle horn on it, and blew it, and it attracted my attention.

Q. Did you live near the river at that time?

A. Right on the river.

Q. That is the only bugle horn you ever heard and the only boat you ever saw, besides this one you mention?

A. I say two, and I say two yet, and that is the only boat I saw going up and down the river, but I saw boats boating wagons and teams across the river.

Q. They are ferries, and I am not asking about that.

A. These were the only two.

Q. The ferries were not operated with bateaux. I am asking about bateaux. Were not you asked this question: "Where did you see such a boat?" and you answered "Below Radford." "How far below Radford?" and you answered "A couple of miles." You were asked "Did you ever see more than one boat?" and you

answered "There might have been more; I never saw but one at a time. I will say one word to put you straight on the business: We lived in Montgomery County, and forded the river every day, and worked them bottoms over there, twice a day." Then were you asked this question: "Do you know if those boats were carrying anything?" and did you answer "It looked to me like they were loaded with some kind of lumber, veneering, or something of the kind from the banks. I was never close to them."

A. That is right.

2005 Q. On cross examination you were asked this: "From 1880 and as long as you have been around the river subsequent to that time, have you ever seen a bateau carrying supplies on New River?" "A. Just as I told you, I saw a boat going up and down the river." "Q. You saw one boat?" "A. About once every week or maybe two." Now if you saw a boat once a week, over how long a period did you see a boat on New River, your answer was "about once every week or maybe two," now how long did you?

A. While I was farming. That was about fifty-seven years ago.

Q. Then you did see more than one or two boats?

A. I might have seen one or two or more. I could not say.

Q. When were you born?

A. I was born on January 1, 1864.

Q. Weren't you asked this question: "You saw one boat?" "A. About once every week or maybe two." "Q. Was that before 1880 or after?" "A. Before 1880." Is that correct?

A. Yes, sir; that is correct.

Q. And on Redirect Examination by Mr. Thompson, weren't you asked this: "Q. This place you speak about fording, could you ford that all the year around, in high water?" [Interrupted.]

A. We did. We put out a crop and hauled it across the river.

Q. Didn't you answer: "No; we couldn't; we couldn't ford it in high water. At times we couldn't ford it."

A. No, sir, I didn't.

Q. Do you swear you didn't.

A. I certainly never made any such statement as that. It must have been added.

Q. Do you now wish to change your testimony?

A. No, sir.

Q. What do you want to say about it now?

A. I don't remember making any such statement as that, only at certain times we could ford the river, is that what I said?

Q. I will read this again. Read it for yourself.

2006 A. I done read it, a copy of it, up home.

Q. How recently did you read it?

A. I read it about a week or ten days ago.

Q. I will read it again: "Q. This place you speak about fording, could you ford that all the year around, in high water?" "A. No, we couldn't we couldn't ford it in high water. At times we couldn't ford it."

A. There was times we couldn't ford it, but I don't remember making that—of course there was times you couldn't ford the river, when it gets swelled.

The witness, on Redirect Examination, testified as follows:

We went across the river there in the spring of the year and plowed the land and planted the corn, and in the fall of the year we cut it and hauled it out. In the event there was a flood we couldn't have crossed it. In '78 they had a flood that washed everything away up there. I suppose the river was normal when we were doing our fording.

I did not mean to convey the impression that we could ford New River when it was up. This deposition of mine which has been read to me was taken at the Court House some time ago. I don't remember the date.

Senator Noel and another gentleman came to my house to get me to give my deposition. They didn't stay very long and I didn't pay much attention to them.

The witness, on Recross Examination, testified as follows:

Q. When you gave your deposition, Mr. Abbot was there, wasn't he, the gentleman who has been examining you?

A. He was there with another gentleman, with a police justice.

Q. He was at your house?

A. Come up by my house.

Q. He was there when you were examined on the stand?

A. Yes, sir; he was right there, and Senator Noel was there, too.

2007 The deposition of William Robert Gerald, taken at Radford, Virginia, February 3, 1936, was then introduced out of order by the plaintiff.

The witness on Direct Examination testified as follows:

I am 72 years old and have lived in East Radford about 50 years. I was born in Giles County on New River in 1864 and lived at Eggleston Springs until I was 5 years old and then came to Waldon (then known as Brown's Tank), where I stayed about 12 years. I then moved to New River in 1880 and helped build the New River Road. The Town of New River is located across from Radford and in front of General Wharton's home. I worked for the Norfolk & Western R. R. for 51 years. I am a retired engineer now. My run was from Radford to Bluefield, from Radford to Williamson, from Radford to Norton, from Radford to Bristol and from Roanoke to Bluefield. My father

was a farmer. I lived with him on the farms he rented until I was 15 years old. I was 15 when I began to work for the railroad.

Q. Now state whether or not you have ever seen any bateaux on New River?

By Mr. FORBES. This question is objected to because leading.

A. Yes, sir.

Q. Describe those boats?

A. The boat looked to me like it was about sixty feet long and four men in it polling it up and down New River.

Q. Where did you see such boat?

A. Below Radford.

Q. How far below Radford?

A. A couple of miles.

Q. Did you ever see more than one boat?

A. Might have been more, I never saw but one at a time. I will say one word to put you straight on the business. We lived in Montgomery County and forded the river every day, and worked them bottoms over there, twice a day.

Q. How deep was the river there?

A. We forded it with a team.

Q. How deep would you say it was?

2008 A. I don't know; I don't suppose the deepest part was over five feet. I don't reckon it was more than four feet, the wagon wouldn't wash around, we crossed it in a wagon.

Q. You crossed at a shallow point?

A. We crossed at the island.

Q. Do you know if those boats were carrying anything?

A. It looked to me like they was loaded with some kind of lumber, veneering, or something of that kind, from the bank. I never was close to them.

Q. How close would they go by?

A. Sometimes out in the river and sometimes close to the bank. It all depended on the channel.

Q. Did you ever know of the Government doing any work on the channel of the river?

A. I never saw it, my daddy said they made an appropriation for the channel.

By Mr. FORBES:

I move to strike out his answer as hearsay.

Q. Did you ever see any channel in the river?

A. No; I crossed below Radford and no channel ever put below Radford that I know of.

Q. I believe you said that you could see the boats from the shore?

A. Oh, yes.

Q. And you understood they were carrying lumber?

A. It looked to me like lumber.

Q. Do you know if these boats carried any farm products?

A. No, sir; I could not say.

Q. Did you ever see any boats that were run by other than man power on this river?

A. Didn't see any, they had some, but I didn't see them.

Q. How do you know they had some?

A. The reason why I know it—the City was dry, local option voted liquor out and everything of the City, and a man by the name of Morgan had a boat over there, they said you could
2009 take a boat over there and get liquor, but I don't drink liquor and never went about it myself?

By Mr. FORBES:

We move to strike out the answer because hearsay.

Q. Did you ever see the boat from a distance?

A. No, sir; it didn't come down any further than Dudley's Ferry. I was busy on the railroad working, and didn't pay much attention to such stuff.

The witness testified on Cross-examination as follows:

I forded the River every day when I was working with my father on a farm. We came down and forded straight across the River at the lower end of the Island. The farm was at the River bottom. The farm ran right down to the ford.

Q. Counsel asked if that was the most shallow place in the river. You don't mean that was the shallowest place on New River?

A. It was except down at Dry Branch, about a mile wide, and I could walk across there and not get my shoes wet.

Q. You are not speaking with regard to the entire length of New River?

A. No, sir.

I worked on the construction of New River Division of the railroad. I never saw any supplies brought down the River on bateaux for the purpose of this construction. I started working for the railroad in 1880.

Q. What were you doing then?

A. They graded the New River road over here and they had a construction train that hauled the material, and then the foreman would load the ties on the car and haul them along and then drag out the iron and spike that down, and when the material got a right smart piece from this train they had the track so the train come up and loaded this stuff and that is how they got supplies for building the road, the New River Road.

I did this work from 1880 to March 10, 1883 when the Road was completed into Pocahontas. After that I went to braking for a

Mr. Butler. I did this for about 2 months and then during the latter part of August 1883 I started firing. The 1st of September 1886 I was given an engine and the 1st of April 1890 I took a
2010 passenger run. I was along New River all of that time and saw it from time to time.

Q. From 1880 and as long as you have been around the river, subsequent to that time, have you ever seen a bateau carrying supplies on New River?

A. Just as I told you, I saw a boat going up and down the river.

Q. You saw one boat?

A. About once every week or maybe two.

Q. Was that before 1880 or after?

A. Before 1880.

Q. I asked you if after 1880 you ever saw one?

A. I never saw none after 1878 when they had the flood.

The witness testified on Redirect Examination as follows:

I spoke about a place some distance from my father's farm where the River was so shallow I could wade across it. I don't suppose I could wade across it there in high water. We could walk across there in 1881. We could walk across there in the spring, in June or July somewhere. That was in the summer rather than in the spring. That was during low water.

Q. That is the only year you remember when you could do that, isn't it?

By Mr. ABBOT:

We object to your leading the witness.

A. No, sir, several years the railroad had to cut a canal out in the river to get water to put in the tank at Dry Branch.

Q. How wide is the river at that point?

A. Somewhere in the neighborhood of three quarters of a mile wide, I reckon.

I did some construction work on the railroad. The road started from New River and went west. We stayed on the River until we got to Glen Lyn, then we went 26 miles up East River to Bluefield. We stayed right on the River until we got to Glen Lyn. Sometimes the River would wash the track out when it was high. We could not ford at this place I spoke of when the water was high. At times we couldn't ford it. We crossed the River on a wagon in April and May and planted the corn and hauled it back over home in Montgomery County.

2011 A. MOORE, on Direct Examination, testified as follows:

I live three and a half miles out of town on the Rocky Mountain Road. I was born in Johnson County, Tennessee, on the 26th day of September, 1856. I moved to Allisonia on New

River in 1878 or 1879. I have lived at Allisonia on New River. I don't remember exactly how long I lived there but some 30 years or more.

I remember the Boom Furnace. I didn't work for that company, but I worked right close to the furnace. My father was an iron maker, and that is how we happened to be there. We lived on Smith River in Franklin County. We went there after the freshet that washed our dam out. A short time after that we went to Pulaski County, and started up an iron works there on Little Reed Island. Our forge on Reed Island was between a half and three-quarters of a mile from the mouth of the river, the two Reed Islands came together, Little Reed comes into Big Reed just before it enters into New River, and it was just above on Little Reed Island. I suppose that was two miles or a little over below Boom Furnace.

We hauled iron from Boom Furnace. I hauled for old man Windle. I was boarding there and drove his team a right smart time, hauling it over to Dublin or rather to Possum Hollow, We would then dump it there and an old farmer would haul it on into Dublin. The drive was too far and I know of several teams that hauled iron at the same time. There was a four-horse team of Frank Smith, he hauled before we commenced, and Mr. John Windle had a team, and his two sons had a team each, and I hauled a short time with them. I knew the old settlers, that is, the Howards who lived up there. I couldn't say positively whether they hauled any iron. I understood several parties hauled at different times, but it has been so long back it is hard to remember anything about dates or anything else.

I have seen iron boated down there. I don't remember when that was, it was somewhere in the 80's I reckon, they were boating there at different times; I saw one and maybe as high as two boats at the mouth of Reed Island, loading iron. I didn't see that for very long. It was different times. It didn't
2012 seem to get along very well and the boats disappeared, I don't know what became of them, whether they washed away or anything about them. This boating might have continued a year or more, off and on, but I couldn't say because it did not interest me, I was not concerned in any way, it was not my business. It might have been six months more than a year, but it was not a regular thing, on account of the condition of the river and so on, they would make a trip and then maybe you wouldn't see them for two or three weeks. This might have happened within a period of less than eighteen months. I am not positive, it has been so far back.

After the boats disappeared the iron was hauled away on teams. It was hauled to Dublin. I have understood some probably went to Pulaski but I don't know about them. This I know about went to Dublin Station.

Q. And that was after the boating ceased?

A. No boats there. It had been some time. I don't know where the boats were. I didn't see them or know of them. I don't know if they washed away or what.

I was there when the railroad was opened to Foster Falls, I suppose in 1886. I helped to put in the pier, all the stone across at Howard's Ferry, and put in the pier at Reed Island Bridge, where this iron was loaded, the west pier. When the railroad was opened up I don't know how the iron was hauled away then, you see that branch ran by Reed Island, they hauled the iron down there, I suppose, when they got to shipping, they might have stored the iron up, I don't remember. Of course after the railroad operation began it was hauled away on the railroad. I was there before the Boom Furnace was built. I know when it was started, but I don't remember the year it did start.

Q. Do you remember when it stopped after it started operations?

A. I suppose the Virginia Iron, Coal and Coke Company operated that furnace after it went over into their hands.

It ran pretty continuously. It would go about nine months and then have to blow out for a new hearth. I was employed
2013 after the furnace started for old man Sam Crozier, and followed prospecting and developing mine ores. As far as I know the Boom Furnace never shut down or stopped operating for other causes than normal operating causes. When I left Allisonia, they had not been operating for some time. I have been away from Allisonia about twenty years. They stopped after the Virginia Iron, Coal & Coke Co. took that property over, as they did all the others, the Graham and Robinson and Reed Island Company. I couldn't tell how long it has been since they took it over, but they operated it several years when Graham & Robinson went out, and transferred that property to the Virginia Iron, Coal and Coke Co. The Boom Furnace operated some time after the Cripple Creek Division of the Norfolk & Western Railroad opened up. They operated some time after the railroad was built up there, that started up all the work there, the mines and everything. That continued a number of years after the railroad was put in operation.

The witness, on Cross Examination, testified as follows:

I moved to Allisonia in 1878 or 1879.

Q. These things you have testified about on direct examination, they are, as you recall, that is, the best of your recollection?

A. I am positive of these things. I am not positive of the dates, but the statements I make I am positive of them.

Q. But as to the dates and length of time, it is rather difficult for you to say?

A. I won't make a statement unless I know. I am positive when it comes to a fact.

Q. You did tell Mr. Abbot you were rather vague as to exact dates and periods of time?

A. Yes, sir, lots of things I can't recall exactly the time.

Q. Did I understand you to say you transported pig iron by wagon from the Reed Island furnace?

A. We picked it up on the other side of the river. I never hauled except from the house on the other side. I hauled three or four months for old man John Windle.

2014 I was not hauling from the furnace to the river. They would go up and get this iron from across the river and we would haul it down to this old farm in Possum Hollow and he would transfer it to Dublin, to the railroad. I don't remember any pig iron having been hauled to any station except Dublin. I understood some had been taken to Pulaski.

Q. But you never heard of any being hauled to any other station?

A. No; I didn't.

2015 Q. And, as a matter of fact, there wasn't any?

A. I couldn't say that, or how many teams hauled there. I know the ones I saw and hauled with, and from the same house, there was three there.

Q. Three teams?

A. Yes, sir.

The daily output of the Reed Island Furnace was supposed to be about eight ton, but I don't think it made it; one of them little charcoal furnaces.

I couldn't tell exactly when the furnace started operating, it was some time in the 80's, and it was when the furnace started that this boating was done, I think, but I am not positive about the dates, because I don't know, it has been so long ago and nothing in the world to concern me about. I had no concern in it, and had other business of my own to tend to. I saw some of the pig iron transported from Reed Island Furnace but to have seen all, I would have had to be right at Howard's Ferry and my business was not there. To have gotten at the facts I would have had to be there every day all day long.

The transportation I have spoken about on the river, that is, transporting pig iron, was only the times I saw the boat, and hearsay of the men boating, telling me at different times of trouble they had on the river making their trips to Radford.

I knew two of the men personally that were boating, a man named Lawson and O'Dell, and they would tell me different times what occurred on the river.

There was only two places on the river, between Reed Island and New River, I knew nothing about. One from the mouth of Max Creek to the Appalachian Dam, and the other is there at Crump's Bottom, the mouth of Indian Creek, to Glen Lyn, but every one from Kanawha Falls I have been over. I know all about the river from Ivanhoe on down to the mouth of Max Creek, then from Max Creek to the Appalachian Dam I don't know, but I do know from the Appalachian Dam to Glen Lyn, and from Crump's Bottom I don't know anything about, and from there on to Kanawha Falls.

Q. I will ask you if it isn't a fact in the year 1882 if there was not transported from Reed Island furnace to New River Depot, by keel bottom boat, 900 tons of pig iron?

2016 A. Well, I don't know what tons it was, but there was iron transported at that time, along about that time, but as to the amount I don't know nothing about that.

Q. I will ask you in that same year if there wasn't transported in exactly the same fashion, on the same river, 256 tons from Radford furnace to New River depot, that is Max Creek furnace?

A. I don't know about that.

By the COURT. All those figures been put in evidence?

By Mr. AIKEN. They are in evidence. Government Exhibit No. 39.

By Mr. ABBOT. We don't think hearsay an engineer puts in a report is proper evidence.

By Mr. AIKEN. It is in the record.

I know very little about Max Creek Furnace. That furnace was built when I went there and running, and it was hearsay as to how some iron went away from there. I never heard anything about boats. I have heard remarks made by the teamsters, reliable men there, that they had seen six mule teams cross the ice at the Max Creek Furnace with a load of pig iron for Dublin Station.

There was very poor roads in those days. The number of horses used in teaming the iron over the rough places in the road between the river and Dublin, depended on the tonnage they had on. Two horses usually carried a ton. In bad weather, rainy weather, or snow, the roads were practically impossible, they were rough.

I don't know about their using the river at those times, to take the pig iron to the railroad, but I would see some of them in there and would hear them talking about going down and

how long it took them to go down and back up the river, but as to knowing it personally, I don't know.

I couldn't say positively when the first train went up Cripple Creek Branch, to Ivanhoe. I was there and helped to put in the new bridge across Reed Island. I suppose that was around 1884-1885 and 1886. I was right there when the bridge was fin-
2017 ished. I helped to complete the bridge. I worked for the Phoenix Bridge Company and then I went from there to Tennessee to work for the same company.

The Mack's Creek Furnace went out of blast some time before the Boom Furnace went out. I don't know positively when the Mack's Creek Furnace went out of existence, in fact they had nothing to run on, they had no good ore of any kind, but I am not positive. When the ore ran out at the Reed Island Furnace, in fact, I don't know that it ran out entirely. I don't know why the Virginia Iron, Coal & Coke Company stopped that furnace, they were getting ore there from Rich Hill, and that has ore yet. Half of that belonged to my brother in-law.

I recall a mine on New River in those days, known as the Clark Mine. I don't think ore was transported from that mine, to Hiawassa, by keel bottom boats, they were flat boats. It was only a mile or so that they came down the river and then took it on down to the ferry, or that is what they told me, I didn't see that. I know they were hauling out ore and I know about the times, but I don't know that I noticed the boats, but if there was any, it was not hauled on keel bottom boats, it was flat boats. It was on the river, but I don't suppose it was over half a mile and then they crossed on the other side and unloaded and hauled it to Mack's Creek Furnace. I remember that, from the Clark Mine, but it was on flat boats. I saw the boats, but I don't reckon there was more than one. It didn't take much to transport them only about a quarter of a mile, then they hauled by wagon to Mack's Creek. They would haul a ton or two on the boats at a time, coming from the mine. They loaded it on there and took it down. I don't suppose it was over half a mile. They landed on the other side of the river and then they took it to Mack's Creek. That was my understanding.

I don't know the tonnage of the keel bottom boats that plied between Reed Island Furnace and New River Depot. They were not ten-ton boats. Ten tons would put them on the rocks. I understood they were six tons. I heard them speak of loading it, and I understood it was six tons, but I am not positive, and I seen them pushing them down there. It took a full day
2018 if we had no bad luck to go to Radford, and two days if we had good luck to push back. There were three men on the boats going up. I never knew who owned these boats and

I don't know whether the Reed Island Furnace leased them or not, Mib Odell and Clave Lawson were two of the best boatmen, and possibly Floyd Tipton and James Evans Owen. But Odell and Lawson I knew.

I don't know that I ever saw two boats go to Reed Island for that ore during that time, but of course, I was not there at the wharf where they loaded it all the time. I had no business there, but the time they were putting those piers in there I hauled stone across where this iron was loaded at the landing at Howard's Ferry.

I don't know whether part of the stone that went into the bridge at Hiawassa was carried by boat, they might have done it. I had nothing to do with that bridge. I was speaking of the bridge across Big Reed Island. I don't know where the stone came from and I don't know and was not there when the bridge at Hiawassa was put in. But I know where the other came from. I hauled a big lot of it across there.

ISAAC HUFF on Direct Examination testified as follows:

I live near the old Boom Furnace and am running a little store there now. I am 78 years old and was born in Carroll County, about four miles east of Hillsville.

In the fall of 1882 I came to the New River Country, to what is called Dry Pond Mountain, near Boom Furnace. At that time I went to work in a saw mill. They were building up that boom furnace and there was a little village there and we sawed lumber first for that. I was working for the furnace company. I worked there something like six or eight months. I then went on the railroad below Allisonia, where they first went to work grading that road. As well as I can remember I worked there two or three months. I then went back to the Boom Furnace, on Little Reed Island Creek. Little Reed Island Creek and Big Reed Island Creek come together about a quarter of a mile before they run into New River.

When I went to Boom Furnace most of the pig iron
2019 from this furnace was being hauled by wagon to Dublin.

The rest of it was being hauled to Martin's Tank, which is now Pulaski. This hauling was kept up more or less until trains began to run to Allisonia. After that time the iron was freighted on the railroad.

Q. Mr. Huff, after you came to the furnace was any iron boated down the river?

A. Not to my knowing.

Q. You would have known it if there had been any, wouldn't you?

A. Yes, sir.

Q. Did you know whether any ore had been boated?

A. I heard talk of it, but that is all I know.

Q. That was before you came to the furnace?

A. Yes, sir.

Q. When you were up there at the sawmill getting out this lumber, did you have anybody work for you who had boated, or not?

A. I heard them talk that they had.

Q. Who were they?

A. One was Clave Lawson and one was Tom Bland, and I think one was named John Brown, a colored man, and Tom Brown was a colored man.

That was while I was working up in the mountain at the saw mill before I came to the railroad and then later went to the furnace. The company kept about four or five four-horse teams. I would take these teams from the stables in the morning. Some of the teams would haul coal and some would be put on hauling the iron. Mr. W. R. Tipton, the superintendent for whom I worked would give the instructions as to where the teams would go. I carried out his instructions. I cannot recall any one else hauling iron, except Mr. Frank Smith, who ran his own team. Mr. John Windell who lived at Allisonia, also hauled some iron.

The Boone Furnace closed down and stopped operating about the first of the World War, along about that time. Sometimes the furnace stopped several times before that when they put in new hearths or in-walls. The furnace operated pretty regularly after I got there until the railroad came in. By that I mean that the furnace would go on for seven or eight months and then it
2020 would have to blow out while they would put in an in-well, or new hearth. That would be just the natural repairs from the operation of the furnace. It never stopped when they did not have to make repairs unless as a result of high water. Then they would bank the furnace and hold it for a week or ten days. Outside of that it kept going all the time. I can't recall that the furnace stopped on account of hard times, while I was there. The only time I do recall that the furnace stopped was on account of high water, replacing a hearth or making some necessary repairs.

The witness, on Cross Examination, testified as follows:

The company had five or six four-horse teams. On some days the teams would all be engaged in hauling charcoal and then maybe the next day or two they would be hauling iron. It took about as much of the team's time hauling charcoal as it did hauling iron. The iron was moved by wagon. If the iron had been moved by boat, it would be necessary to haul it on wagons from the furnace down to the river.

Q. You say you moved to Reed Island Furnace in 1883?
A. In the fall of 1882.
Q. I understood you to say that there had been a big lot of iron boated down the river just prior to the time you got there and according to your recollection there was none afterwards. Is that right?
A. Not after I got there, to my knowing.
Q. What were your duties there?
A. Looking after the placing of the men in the furnace. We had what we called a filler to fill the furnace and a gutter man to take the iron out, and a keeper, who put in a twelve hour shift on each one.
Q. So you were busy around the plant itself?
A. Most of the time.
Q. How far was it to the river?
A. A couple miles or maybe a little more.
Q. You could not see the river from the furnace?
A. No, sir.
Q. Now you have stated that most of the pig iron which was transported by wagon went to Dublin. Is that right?
2021 A. Right at that time, until the train came to Allisonia.
Q. I say up to that time it was transported by wagon?
A. Yes, sir.
Q. And you say there were some that you think went to Pulaski probably later?
A. Yes, sir.
Q. Those are the only two places that the iron was transported to by wagons?
A. At that time.
Q. Now what time are you referring to, 1882 when you arrived there, to when?
A. 1882 and 1883.
Q. And 1884?
A. My recollection is that the railroad came to Allisonia in 1886 and when it was completed then we hauled there.
Q. The... between 1882 and 1886 Pig Iron was hauled by wagon to no place except Dublin or Pulaski?
A. I cannot recall. Most of it was hauled to Dublin and to what we called Martin's Tank at that time.
Q. That is now Pulaski?
A. Yes, sir.
Q. You were there and you knew where the iron was going?
A. Yes, sir.
Q. And you know that none of it went on the river. Is that right?

A. Yes, sir.

Q. I will ask you if you ever heard that in the year, 1882, the very year you moved to Reed Island Furnace, if 900 tons of pig iron did not go down New River on keel bottom boats, to New River depot?

A. I never heard that.

By Mr. ABBOT. If Your Honor please, that is not a fair quotation of the hearsay information contained in the engineer's report and it happens to be in the record and I would like for Your Honor to read it.

2022 By the COURT. Where is that?

By Mr. ABBOT. In the annual report of the Chief of Engineers for the year 1883, which is for the fiscal year ending June, 1882.

By Mr. AIKEN:

I will hand Your Honor a copy of it so that you can read it. (Copy of said report is handed to the Court.)

Q. Mr. Huff, you say you do not recall anything about that?

A. No, sir.

I know nothing about the operation of the Mack's Creek Furnace. That is seven miles below there. Hiawassa is two miles below Allisonia. There was no iron shipped from Reed Island Furnace by the Norfolk and Western until 1886 or later. The roads in those days were very poor. It was a tough pull for a four-horse team to pull two tons of iron. It was every bit of twelve miles from the furnace to Dublin and it was over some considerably hilly county. I now live right there at the old Boom Furnace, right in a half a mile of the place. I have lived in that neighborhood from the time I came there, for about 54 years. I have occasion to see the river every few days. I have to walk or ride two miles to see the river. I have no interest or stock in the Appalachian Electric Power Company.

By Mr. ABBOT. If Your Honor please, I want to call your attention to this engineer's report that Mr. Aiken has been referring to here. It is dated May 21, 1883, and is from Wm. Proctor Smith, Assistant Engineer, to Lt. Col. Wm. P. Craighill, United States Engineer, and there is this statement in it: "Something over 900 tons of pig iron were shipped from Reed Island furnace, 26¾ miles above New River Bridge, to the Norfolk & Western Railroad, at the latter point, and 256 tons from Radford furnace, 18 miles above the bridge."

It does not say how it was shipped, or when it was shipped, or over what period of time it was shipped.

2023 The witness, on Redirect Examination, testified as follows:

After 1886 the iron from the Boom Furnace was shipped over the Cripple Creek Branch of the Norfolk and Western. Before the Cripple Creek Branch was put in operation the iron was shipped from Pulaski, (Martin's Tank) and Dublin over the Norfolk and Western.

I came to this saw mill to saw lumber in the fall of 1882 and stayed there for six or eight months. Then I went to Allisonia and stayed there for two or three months. After that period of time I went to Boom Furnace. The saw mill was running when I came to it in the Fall of 1882. I didn't see any iron shipped on the boat while I was working on the grading at Allisonia. The railroad bed I worked on ran from Allisonia to the river and it went across the river to Hiawassa. I was in sight of the river all the way along there.

By Mr. AIKEN. If Your Honor please, in view of the statement made by Mr. Abbot a little while ago, although I think it is inappropriate to engage in any argument or controversy at this time, I do want to say in answer to his statement, that the question I asked the witness was not predicated, or did not refer to the Report of the Chief of Engineers. I merely took the data from the exhibit to test the witness' knowledge of the situation, but I will call this to Your Honor's attention in this report of Wm. Proctor Smith to Lt. Col. Wm. P. Craighill, which is dated May 21, 1883:

"I have the Honor to submit the following report of operations on the improvement of New River, Virginia and West Virginia, for the fiscal year ending June 30, 1883."

2024 J. H. KNODE on Direct Examination, testified as follows:

I will be 80 years old on the 26th of October. I live four miles northwest of Pulaski City. I was born at what is now called Poplar Hill, about eight miles east of Giles County Court House, Pearisburg, in Giles County near the river. I could not say positively how long I lived there, I was eight or ten years old, anyway. I then moved over to the lower end of Back Creek in Pulaski County, about two miles from Parrott. I was then about two miles from the river. I stayed there until I was about fifteen years old. I then moved to what is known as Dunkert's Bottom, and lived there about twelve years. After that I moved to where I now live, four miles west of Pulaski.

I remember very distinctly when the Government was improving New River. I had a job with the Government at the time they were cleaning up the river. When I went with them they were working on the channel at Ingles' Falls, near where the electric dam site is now. I worked up the river with them to a

little above Allisonia. We camped on an island at the mouth of Peak Creek. The foremans and men interested in the Government work were camping there. That was the year of the big flood, 1878. I think that was the fall of the year—probably the last or middle of September, or it might have been nearly the 1st of October—right near that time—there came a terrible wet spell of rain and the river was at high tide, and the men that had charge of the work would not risk my watch, but they had me take their watch, and they put up a stob at the river, with figures, and asked me to look after it and report every 30 minutes to headquarters. And at that time, there were about 30 or 40 encamped on the island. I reported the condition of the river at each time in 30 minutes, each time on the mark, to headquarters, and I don't remember now exactly the height of that stob, but it was put there and the figures on it were plain, and I remember the last time I reported, I had reported the river over top of the stob—no figures were to be seen. Then
2025 they ordered me to wake up everybody in camp; take the tent clothes from the tent—there was a tree in the middle of the island, and wrap the tent cloths around the tree; order a bateau—we had one close there—brought up, and every man was ordered to get in that boat, and then, when we got the tents wrapped around the tree, each man got in the boat and then they received orders for no man to speak above a whisper, except the man that was the manager of the boat. In the lower end of the island was a sycamore tree, and I would say that there was a fork up about 12 feet, and so dark it was, you could not see anything—not hardly see your hand before you—The head oar of the bateau went, in the dark, into the sycamore tree and the boat came to a sudden standstill, and I can remember as if it had happened today on each side you could see houses and straw ricks going down—it was a bulk; you could not see them going—you could see a bulk. The reason I remember as well as I do, they ordered for no man to speak above a whisper, and there was a nigger on the boat that was not considered extra bright, and he was praying for the niggers and the white folks, too. I remember that distinctly. There were other boats tied up at different places on the river.

This island was on one side of the river, right nearly on one side; and these boats were loading stone and was tied up on the other side of the river. These boats on the other side of the river broke loose, but didn't break loose until the next morning after day-light. Consequently the river was raising slightly up until after daylight the next morning. It was 11:30 when we went out of there, I remember, and those boats broke loose and

I was two miles below at my home where my father lived, and those boats came along; we could not catch them then.

Later on I taken a force of men and gathered up such Government property as would be of any account, from there to Hinton, after the river went down. I recall finding one boat at Dry Branch; it was, possibly was not a quarter of a mile—but some several hundred yards from the river. I did not find any other boats which were any good. There were four boats that we used for gravel boats. We found them, one at Dry Branch, one at Narrows; one was torn all to pieces—it had a small derrick on it. There was a tide in the river when we went down, there had to be, or we could not have gotten down.

2026 Q. Do you remember going through the falls at the Giles and Montgomery lines?

A. Yes, sir; the most dangerous falls between where we worked and Hinton.

Q. Did you go through all right?

A. We took our baggage out and carried it down and let two men take a boat through. They didn't let more than two men on it.

Q. After you got the property down the river, what did you do—who did you turn it over to?

A. What did we do?

Q. With the property that you gathered up from the river?

A. We turned that stuff over to somebody at Hinton. The name I cannot recall.

Q. Who was that somebody?

A. Some fellow that we turned it over to that had to be responsible for it—he was a Government agent.

Q. Did you do any work on the channel there after that?

A. Yes, sir; I worked part of two years on the channel in West Virginia.

Q. Did you do any boating down there while you were in West Virginia?

A. Yes, sir; after they abandoned the work in the State, I went to work the balance of the season for up until towards Christmas. We young fellows then always had to come home to take Christmas. We lived in another State, and a man named Tom Quinn was boating and he hired me.

Q. How did that happen?

A. I found him stalled in the falls.

Q. What falls?

A. Bull Falls, and I don't know—I reckon maybe I wanted a job, and I said "Can't you get over here"—and he asked me if I would help him over the falls, and I said—I suppose I wanted a job—I said: "Yes." Well, he was loaded a little—he had

about, oh, 1,500 pounds of merchandise of some sort and he had two men shoving, and I put these two men on one side
2027 of the boat and I took the other side, and I put him up over there, and when I got the boat through, he proposed hiring me. Well, I was looking for a job, of course, and I hired to Quinn. That was Tom Quinn, an Irishman; I worked for him ten days, I reckon, and payday come and he could not pay me. Well he proposed to rent his boat, and I rented it, and then I went to boating for myself, what time I did boat.

I would say I boated for myself a couple of months. I didn't do any good with the boating. There was nothing in boating. We hauled from Bull Falls to Hinton. We did not try to take the boat up the river with anything in it. I never tried to go up into Virginia with the boat. No, sir, no, although it seems to me a man named Fowler wanted me to come up there and get a load but I never tried it. I never tried to go over the McDaniel's Falls or Harvey's at the upper end of Crump's Bottom.

After I finished up my boating at Hinton, I went back to Pulaski, my old home. After that I undertook to boat from Reed Island—Allisonia rather below the mouth of Reed Island to New River Bridge. At that time I was going to boat pig iron. I had four boats and was running three men to the boat—I had about 12 men in my employ. I kept that up about two months. I don't know whether it was that long; not longer than that. After giving it a thorough trial, I decided there was not money enough in it to pay my men and leave anything for me, and I abandoned the job. I thought I could make ordinary expenses but I found I could not do it. Those boats were built to carry four tons, but we could not carry it. The river was not deep enough, for one thing, and, besides that, if there was a tide in the river, and as rapid as that river runs with a tide in it, and a boat with four tons of iron on it—if you happened to have an accident and were not a good swimmer, you were gone, and the men would not risk their lives on a boat loaded too heavy in that kind of a tide. Many times going down the river we would be stuck on the gravel and have to unload. By unload I mean throw out enough so that the boat would rise off the gravel and go. That was the only way to get them along there. When the boats would stick in the ridges, all that we could do would be to throw the iron out. Once in a
2028 while, we would knock a hole, but we never had anything serious, of course, that is not serious enough that we would come close or near to losing our lives, but it was natural when a boat loaded with iron on the river, striking a rock, would cut a hole in it. I have had holes knocked in my boat by striking rocks, but I never had one to sink altogether. We would unload it.

I undertook to bring 100 bushels of corn which I had sold to Rives Tipton, the Boom Furnace operator, up the river on boats. I put about 10 bushels of corn to the boat. These bateaux were made with race boards on them, 2½ to 3 feet apart, and the men that shoved the boats had to walk on them with the pole in the water and the pole on their shoulders. If you covered the race boards with anything, you could not walk up the race plank, and, as swift as the falls were in that river, there was not any use to try to take a boat up, except to pull up the race plank and put your shoulder against the pole and buck the river. By that I mean put your shoulder against the pole and reach down and get hold of the race plank. I have seen them pull it nearly off the bottom.

We threw the iron out at various places between Allisonia and New River. I had some kind of an understanding—I don't remember exactly—and I taken the iron out of the river and took it to Snowville, and swapped it for castings. I got the iron by driving an 8x wagon in the river and loading it on.

I cannot recall exactly the year I made the contract with Mr. Tipton to boat the iron, I believe it was 1882, it might have been 1881; it was not later than 1882, I am sure.

I suppose I kept this boating up a couple of months. It might have been longer but I will safely say that a couple of months was all I could handle it.

After I quit boating I lived right on the river at Dunkert's Bottom and farmed. That is about three miles above Ingle's Falls.

Q. Did you see any more boats hauling iron after that, Mr. Knode?

A. No, sir, I did not see any more boats hauling iron that I worked on for anybody aside from Mr. Tipton.

Q. And you lived on the river afterwards, did you?

A. Yes, sir; I farmed up there; I married and lived there, until I bought a farm where I live now.

I have done some rafting of logs; they used to cut logs along the river, after or probably before this boating was done
2029 and rafted them to New River, and a man by the name of Hodge had a saw place. There was five or six logs laid side by side and a cross piece was put on the end and it was hooked together with hickory or grape vines, and this was called a span. If you had ten spans in it, you had fifty logs. From where they cut them up New River, the most difficult Falls was known as Ingle's Falls, near the dam site, and they would make these rafts during the week, and get them together, and on Saturdays or weekends, they would taken them to New River, and these men would put the logs in the water and I have on occasions worked on the river and they got me to head them through Ingle's Falls, and they gave me $1.00 a raft to put them through there.

Q. Was there any difficulty in getting them through the Falls?

A. Yes, sir. It took good work to get them in there. These little sluices were cut by the Government and were cut near the middle of the falls and the head of the falls was about at the left hand side coming this way, and you had to go around the island and go to the middle of the river to get into the sluices, and it took right fine work to get the raft out; otherwise, they would be tore all to pieces, of course.

We would wait for a tide, if we could get it. We couldn't always do it, but when we had big logs or wanted for success in rafting them down the river, we would be glad for one foot,—for a one foot tide in the river, and sometimes then we would lose them logs—they would be torn all to pieces. I have had some torn all to pieces. I have had them caught in the falls sideways with me and have had them turn endways—a ten foot log. You had to watch what you were doing. We used to bore a hole in the log, about five or six feet high, and put our dinner buckets and coats there, and sometimes in the falls, there wasn't any dinner buckets and coats. I have ridden a log down there once, and there was nothing to the log but one cross piece, and that was about the only thing that kept me from drowning.

I remember Ellison's Ledges. One of my men got married while I was boating iron, and of course, he was the manager of one of the boats, and he had taken his wife down the river four or six miles on this load of iron. She never had seen a river, and you men may not know, but Mr. Draper knows [indicating] that Ellison's Ledge, is high and dangerous, and when we ran into the ledge, this fellow, Godbey, that got married, he
2630 rubbed a rock too hard and the boat cracked like it was busted in two and his wife fainted, and he turned the oar loose and grabbed her and might have drowned all of us. Most any man would do that but it was a dangerous situation for me. I was running right behind him and would have tried to pick them up if I could, but I don't think I could, as fast as I was going. The boat finally got through and didn't break open until he got sort of straight, and then I guess he got his oar and straightened up.

I would say these boats were between 45 and 60 feet long, and they were I suppose across the top seven feet or seven and a half feet and come to a narrow edge at each end, made in rounded shape. And at the time—I want to make this statement, I believe it should be told—at the time I did this boating, there was not a foot of bonded surface road at all in the county at this time. The old State road was there, but these rocks were never crushed, and the road was never bonded, and it was in the winter time, and the only reason I can give about this job of boating, was because it

was impossible to haul iron to Dublin over a mud road at that season of the year, and the Company thought—they had never done anything up to this time—the company thought at this time, in regard to this iron, that we could get it over there without having too much expense to them, and if it was otherwise possible, I would not have gotten the job I had. The old State road was built but the rock was never crushed; the road was never bonded. I built forty miles of rock road myself and I know what the road was at that time and the State road was built by hand and it took a good team to pull an empty wagon over it. The younger people don't know this, but it is a fact. When you undertook to haul iron when the ground was thawing, over a mud road, they could not do that, and the iron was made of a charcoal process, that was a great deal more valuable than it is made of stone coal.

When I found out they could not pay me enough to justify me—enough to pay my men, taking half in money and half in goods—that is what I was getting—they didn't pay all in money—half money and half goods, I proposed to put it under the circumstances. I had a contract with Rives Tipton. Under this contract I was to pay my men half in money and half in goods.

2031 The witness, on Cross Examination, testified as follows:

I had a contract with Rives Tipton, the general manager of the Boone Furnace Iron Co. on Reed Island Creek. The Radford Furnace was down the river on Mack's Creek. I would say it was twenty some miles from Boone Furnace to Radford, or New River Bridge. I would say the time I took the contract to boat iron, was between 1880 and 1883. I can not be as positive as I would like to be. It was four years after the big flood. That was after the Channel was made and I had the Channel from the mouth of Big Island Creek to New River Bridge. I had a Channel through some shoals and riffles.

I cannot recall what the contract called for per ton of iron. The pay came to me half in goods and half in money. I do not know whether any one else was bidding for that contract at that time, as far as I know there was no one. I could not say positively, but I will say I boated two or three months; I will be safe in saying it was two and a half months. The boats were supposed to carry four tons. I don't know how many tons I carried. I loaded when I had a little tide, I loaded four tons and might have come through with four, but I don't remember. I usually made trips with less than four tons. The four boats made two trips a week, to Radford and back. The boats were not tied together, we ran as a fleet at the same time. Twice a week the four boats went to Radford and back. We made 24 trips a month. At New River Bridge we put the iron on the bank of the river; it was hauled twice—once from Boone Fur-

nace to Allisonia and then it had to be hauled again, it made it expensive. I didn't make any money.

Only once did I carry anything else on the boats; when I sold the 100 bushels of corn to Tipton.

I found that I had bid too low on the contract. I was mistaken in what I could do with the boats. That was where the trouble was. I don't believe the men would have stayed with me at the price I gave them. I was not getting enough myself to justify it.

Q. You could not divide up the goods and money?

A. No, sir.

Q. They wanted higher wages?

A. Yes, sir.

2032 The trouble, in my judgment, was with the boats, I had the idea that I could make the boats pay me out but I could not do it. I think it was in 1882 I did this boating; that is as near as I can come to it.

I never saw others boating there on the river then. I have not seen any since then. I have talked with some men that have claimed they boated pig iron there, but I never saw them. I heard that they had boated for several years, but I don't know of my own knowledge about it.

The great freshet I have spoken of was the great flood, and I always thought it was in 1878. It was the greatest flood on New River, it never has been that high since. The boats floated a long ways down the river at that time. We gathered them out of the drifts and took them to Hinton. We took, I think six; not over 5 or 6 boats to Hinton.

Q. When you did that, was it high tide?

A. You mean gathered up the boats?

Q. When you took them to Hinton?

A. Ordinary, not extra high.

Q. Did you say that unless you had a high tide, you could not take them there?

A. We could not have gotten safe through the ledges there.

Q. Don't you know, as a matter of fact, that boats would go on all tides up the river and down and have done so.

A. There is not much boat service on that river, brother.

Q. Don't you know that boats have gone up and down on that river?

A. I have seen them—I could not swear to anything about boating except what I did myself.

I was boating around Hinton two or three months. In 1880 or 1881 I boated staves from Bull Falls to Hinton. I never saw any other boat down there. This boat of mine was the usual size of the bateau boat—about 45 or 50 feet long and 7 feet wide, tapering at the ends. We hauled 900 staves at a load.

We ran for two months and made three trips a week from Bull Falls to Hinton. Sometimes we didn't have staves to haul, and when we were short of loading, we hauled loose hay, not
2033 baled. We operated the boat in November, probably in October or the last of November. There was no ice on the river during that period. There was enough water in the river to operate the boat. We delivered the staves at Hinton to a man named Dunkhart. This all happened after I rented the boat from Quinn. That was the man I think they called Captain Quinn. I do not know where Shanklin's Ferry is. Captain Quinn was running no other boat on the river, but this one, that I knew anything about.

Q. Didn't you give a deposition in this case at Radford?

A. I think so; yes.

Q. In that deposition at Radford, were not you asked whether or not your contracts to haul pig iron from the Boone Furnace was a profitable one?

A. I think so.

Q. Didn't you answer to the effect that it might or might not have had something to do with your abandoning that work?

A. Well, I don't know.

Q. I will read you this question: "The reason why it was not profitable was because you bid too low on the job?" and your answer was, "That might or might not have had something to do with it. Yes; it did have something to do with it. I could not make a success because I couldn't haul enough." Is that, or not, your answer?

A. Yes, sir.

Q. You say that might or might not have had something to do with it?

A. Yes; I might have bid too low. As I said a while ago, that was partly the trouble, and the chief trouble, the way I felt about it, is I couldn't understand what I could do with these boats. It was my first experience with boats in New River. I had rafted logs, but had not tested them out.

Q. How long had you rafted logs?

A. For ten years, off and on.

Q. On New River?

A. Yes, sir.

2034 Q. Where?

A. On the upper end of Dunkards Bottom to New River bridge.

Q. During the period of ten years you were rafting logs?

A. Yes, sir; eight or ten years at different times.

Q. Did you confine yourself to that kind of work?

A. No; not altogether. I farmed on the river, and rafted logs on the weekends.

Q. How long would it take you to bring a raft of logs from Dunkards Bottom to New River bridge?

A. If I had good luck, not over ten hours.

Q. On week-ends you would raft logs, over a period of ten years?

A. Yes; You understand I was farming, and when they wanted me to take a raft they would notify me on Ingles Falls, and I charged them a dollar a raft to put them through there.

Q. You had fairly good luck over a period of ten years?

A. There was not anybody on the river who would risk their lives through but me.

Q. You got your rafts through?

A. Sometimes.

Q. And kept it up for ten years?

A. I didn't get all through.

Q. But you kept it up for ten years?

A. Yes, sir.

Q. And you made a dollar every time you took a raft down?

A. I was acquainted with the river. I was right much acquainted with New River from Allisonia to Huntington, or to get into Huntington, either to Kanawha Falls, and my experience with the river, I got a good deal of it out of Tug River. I built right much of the cut-off between Kanauga and Kenova, and we boated the cement from Levisa, Kentucky, up to Kanauga, and it was not more than half the river that we are into consideration now. To stand on the bank and look into Tug River, it is hard to tell which way the river runs. We did it in flat bottoms, and
2035 we could haul ten tons up the river, which surprised me, and it was sandy bottom.

Q. You say that this was smaller than New River?

A. Not more than half as big.

Q. What sort of logs did you raft down?

A. I rafted logs all the way from ten inches to fifteen or twenty.

Q. How large would the rafts be?

A. Some as many as 45 logs.

Q. What kind of timber?

A. Not much oak, but poplar and pine.

Q. For whom did you raft the logs?

A. For men along the river. H. B. Howe, for one man, that owned a large estate in the Dunkards Bottom section. I don't know, but I might recall some others that had lesser work done.

Q. You have seen other logs on that river besides yours, haven't you?

A. Yes.

Q. You have seen other logs on the river besides yours?

A. Yes, other rafts went down.

Q. As a matter of fact, there was considerable rafting logs on the river?

A. Yes; several people rafted logs. People who had new ground would have logs.

Q. In addition to your rafting logs, there was quite a general rafting of logs on New River in the section you speak of?

A. Yes.

Q. About what distance is that you rafted?

A. What?

Q. What distance?

A. I can't recall exactly.

Q. Eight or ten miles?

A. I would suppose it would be an average of ten miles, I reckon, about ten, taking it all on an average, or about that.

2036 Q. In the rafting of these logs, would you pass the present site of the proposed Appalachian dam?

A. Yes, sir.

Q. Do you know where that is?

A. Yes, sir.

Q. Have you seen it recently?

A. Yes, sir; it has not been so long; I was there a month or two ago.

Q. Do you know the site I speak of?

A. Yes, sir.

Q. Did you notice the cofferdam?

A. Yes, sir.

Q. Do you know the place I speak of?

A. Yes, sir.

Q. Have you seen men working around it?

A. I didn't see them at work, but I was there two or three different times. The day I was there, it was a holiday, or something, and they were not doing anything.

Q. This domestic and infelicitous accident you speak of between a man and his wife is the only accident you know of between Allisonia and Radford, is it not?

A. Who is that?

Q. This accident you speak of?

A. Yes, sir.

Q. That is the only one?

A. I knew a couple of fellows getting drowned in Giles Falls down below.

Q. They are the fellows who were drunk, weren't they?

A. Yes, sir.

Q. Going back to this man and his wife in that boat on that occasion, as a matter of fact, nothing happened to the boat except

it scraped along the ledge and made the timbers crack, and made the wife afraid?

A. Yes, sir.

2037 Q. Her husband was a boatman?

A. Yes, sir.

Q. And there was no reason why there should have been an accident?

A. No.

Q. In telling that, you are not trying to give the Court and the record the impression that this was a serious or dangerous place?

A. No.

Q. As a matter of fact, the boat scraped along this ledge, and the timber cracked, and the man's new wife got scared and screamed; isn't that it?

A. Yes, sir.

Q. And he rushed and seized her, and let the tiller go?

A. Yes, he forgot about the boat.

Q. So the accident was due to the romantic character of the honeymoon trip?

A. Yes.

Q. There is nothing about the accident that indicates traffic is dangerous on that river, is there?

A. I will tell you about the traffic now? A boat loaded, in my experience, is like a car running down a hill: The heavier the load is, the faster the boat will run, undoubtedly, in my experience; and you could not get very many men to promise you that they would work for you on a boat on a tide in New River, because it runs down hill; and it runs rapidly. I know what I am talking about. I have worked there, and I know, and the only thing about it, if that boat is loaded and it is not controlled just exactly right, your life is at stake, if you can't swim, and that is what they knew. The danger with a boat is that when it is loaded and it strikes a rock in New River, and it is not in keeping with the sluice and the current of the water, it will break right in two in the middle, and, of course if it is loaded with pig iron it is not going to float.

2038 Q. You did not have a boat broken in New River, did you?

A. Well, I had a pretty good accident that looked dangerous to me, was this fellow on his bridal tour.

Q. With his wife?

A. Yes.

Q. That is what I asked you in the first place. You say there were no roads up there?

A. Oh, no; there were no roads. The sorriest roads you ever saw, and in the winter time, when they were trying to haul over them, they were cut all to pieces.

Q. People had to come down by river?

A. Oh, well, they had to come over the best that they could.

Q. When did the roads come in there—the better roads?

A. When did they improve the roads?

Q. Yes.

A. Well, the hard road improvement commenced in 1911 in our county. I built 40 miles of hard surface road in the county. I have no idea that if those roads had been in the shape that they are, and this iron had to go to market, that they would have ever worked the boat at all, but the boat was the only solution when they couldn't haul it over the mud road.

Q. The boat was the only solution?

A. It did not prove what they thought it would be.

Q. That is in your experience in your business?

A. Yes.

Q. As to other men going there and carrying pig iron by the hundreds of tons, you can't say?

A. No.

Q. You are not undertaking to tell the Court that other men did not make a profit on it, are you?

A. No.

Q. You are not saying about that?

2039 A. It looks strange I didn't know about that.

Q. You do not mean to tell the Court that your experience in not making money is to give an indication of the experience of others?

A. No. I don't know what they did.

The witness on Redirect Examination testified as follows:

The boat I had around Hinton was called the Wild Goose. It was Quinn's boat. The rafting I have referred to began at the upper end of Dunkard's Bottom. That is at the end of the long pool above Ingles' Fall. There was a gravel there known as Moore's gravel. It was in the upper end of that long pool and there was a riffle about where the rafts were put in—about a mile above. I would say they would average about five rafts a month—maybe not that much; about 40 or 50 rafts would be as many as they would put in there in a year.

Q. Did you have any accidents with these boats that you were boating the iron with?

A. Nothing serious that I know of. When any of these boats would rub a rock hard, they would naturally spring a leak under the timber.

Q. Did the boats do that?

A. They did do that, yes, sir.

Q. How often would they do it, Mr. Knode?

A. I just can't say exactly, but many times, you know. It is like many other jobs: I have handled different kinds of jobs, and if you don't get a man who understands his business, you are likely to have some more accidents than a man who understands his work. Many times I have knowed boats to be broken up like in places where the falls were not so bad, by men being careless in running the boats. It is like operating a car: In operating a boat, you have to be a skilled man to operate it on New River. When you are over one ledge, you are in for that many more. I have rode across New River many times on horseback.

Mr. WILLIAMS. I move that the statement that he "has rode across New River" be stricken.

The COURT. He is fortifying his position. He can explain what he means as he goes along.

Mr. WILLIAMS. The witness was asked about an accident, and he said, "I have rode across New River on horseback without an accident."

The COURT. He did not answer it that way, but he said when you go over one ledge you are on another, and he has indicated a number of ledges, I presume, and I presume he wanted to fortify it by saying that he could ride across.

By Mr. ABBOT:

Q. When you were asked to describe a bateau, you said it was seven thirty wide; what did you mean by that?

A. What is that?

2040 Q. How wide were those bateaux—the keel boats?

A. I couldn't say to the inch, but, in my judgment, they were seven and a half to eight feet wide on the top, and they keeled down to three feet in the bottom, the timbers were. Between these race planks that you walk on to shove it up the river, the race planks were about three feet apart.

Mr. ABBOT. We have no further questions.

By the COURT:

Q. Mr. Knode, you said just before you rented Tom Quinn's boat, he asked you to help him up the river with it?

A. What?

Q. The time you said you helped Tom Quinn get the boat up the river, you said you got on one side and two men on the other?

A. That is right.

Q. Did you get out in the water, do you mean, or on these tracks along the side.

A. Do you mean on the race planks?

Q. Yes.

A. He was loaded with merchandise a little in the middle, and you had to walk up against the timbers, up and down the boat,

to get a foothold up on the race plank. I put these two men up there, and I knew how to catch it there, and I told them "when we shove down to the stern of this boat, I want one of you fellows to help Quinn keep the boat from going down the river until we could get started in the head, and I drilled in the head, and I let the other man come up, and he shoved on one side and I on the other. That put them up over the falls.

Q. You stayed in the boat?

A. Yes, sir.

2041 F. B. KEGLEY, on direct examination, testified as follows:

Q. Mr. Kegley, please state your full name, age, and residence?

A. My name is F. B. Kegley, age 59, residence Wythe County, Virginia; Postoffice address, Wytheville.

Q. Mr. Kegley, where were you educated?

A. I was educated in the common public schools of the County and in the private preparatory schools for college; a graduate of Roanoke College, Salem, Virginia, in 1900; A. B. Deg. continued to study at Roanoke College, receiving M. A. Degree in 1901.

Q. What degree did you receive in 1900?

A. A. B.

Q. What did you do after your graduation from Roanoke College?

A. Taught in high school at Wytheville the session of 1901–02, and returned to Roanoke as instructor in English and History 1902 to 1905. I was granted a Harrison Scholarship, University of Pennsylvania, and did graduate work there 1905 and '06—one session.

I had in mind a continuation of study for Doctor's Degree, but, while there, I took a special course in History under Dr. E. P. Cheyney.

In the summer of 1905 my father died, and we had a considerable farming interest, and there were youths in the family, and I had to return. I was at home that summer and continued in the farming business and my studies there, and looked after the business and the education of my young brothers and sisters.

Then I taught in Wytheville High School again, history and English, 1907 to 1910, being interested in agricultural work as well as educational work.

I became Agricultural Agent, or County Agent, and did extension work in Wythe and Washington Counties 1910–1912, and returned home and retired to the farm and books, and continued my study of history from that time to now.

Q. Mr. Kegley, have you made any special study of the history of southwestern Virginia settlement and the early routes

2042 of trade, transportation, and travel to and from such settlements?

A. Yes.

Q. Will you state briefly the nature and scope of your studies in that field?

By Mr. THOMPSON:

Q. May I ask what that document is you have?

A. It is notes.

Q. Notes from histories?

A. Yes; history, and what I am giving you.

I would like to add one other thing as to education, if I may; I have been studying history with a view of writing or developing a book now in the press. It is in printers' hands except the last chapter.

Q. May I ask also if those are your own notes?

A. Yes; absolutely.

For the last ten years I have done necessary research work for inscriptions on highway markers for the counties of southwest Virginia—these metal markers that are placed along the roads.

By Mr. JACKSON:

Q. Will you state briefly the nature and scope of your studies in connection with the history of southwest Virginia settlements?

A. My interest has been chiefly in the early history of the southwest. I have tried to get at the facts. I have examined the source books rather than secondary histories, and checked them with the historical writings that have been published.

Q. Did you work on any thesis during the course of your college days?

A. I planned the thesis at the University, the thesis for the Doctor's degree. The subject of that thesis was the history and development of Southwest Virginia.

Q. You referred to some writing: Have you written anything for publication on the history of southwest Virginia?

A. The writing I have done is the preparation of the book I suggested—The Virginia Frontier.

Q. What is the stage of your work on that?

A. That is practically finished. There is some work on the last chapter yet.

Q. Is there one or more volumes involved?

2043 A. I anticipated a series of volumes. The first is Extension of the Frontier, the extension of the frontier towards the southwest.

Q. Mr. Kegley, is this first volume of this history in the hands of the printer, or not?

A. Yes.

Q. Just generally, what does it cover—the field?
A. The extension of the Virginia frontier from the beginning, the early Colonies, towards the southwest. It is a rather de-led study of land grants and settlement of people and the ites traveled, and especially the development of the settlements, history of the local James River and Roanoke valley.
Q. Have you collected the material for another volume?
A. A great deal of the material is further west, since that is my me territory, and was worked out and collected before I cen-ed on this section. This settlement antedates that. A great ny of these people moved up into New River and the Holston ion, and in order to understand that I was studying this down e.
Q. Does that second volume, for which you are collecting mate-l, cover New River?
A. Yes, sir.
Q. When was New River discovered?
A. In 1671; the expedition was sent out and sponsored by Col. ram Wood, to Fort Henry, and by Batts and Fallan.
Q. What name was given to the river at that time?
A. They called the river that they found Woods River, for sponsor of the expedition, Abram Wood.
Then there was a great deal of interest in the extension of the ny at that time, by historians and map makers of England France.
This New River appeared on the maps of the period. So that ccepted generally, I think, as the explanation of the name w—it was named New River, and then it came to be the New er, and then New River.
The whole river, Kanawha and New River, were considered ne river, sometimes called the Great Kanawha, but in later periods the lower part of the river became to be distin-guished as the Kanawha or Great Kanawha—the Great Kanawha to distinguish it from the Little Kanawha, an-er river going into the Ohio, and the upper part above the junc-of the Gauley, has been designated New River.
Q. When did the settlement of the New River Valley begin, Kegley?
A. So far as the records or dates can be obtained, in the summer fall of 1744 and 1745. Actual land grants were made under veys beginning in the fall of 1745, and the people were on the und—there were quite a number of people on the ground—re actual records.
Q. What were the sources and general trend of movement of lers into New River Valley?

A. The first people were Pennsylvanians. Just as in the Shenandoah Valley, the Pennsylvanians worked through the Appalachian Valley to the southwest, and came across the James, through the Roanoke Valley, crossed the divide, the Alleghany Divide, about present Blacksburg and Christiansburg, touching the river directly west, and those earlier settlers are found, of course, on the near slope, the first slopes that they came to, and along the bends of the river from Dunkards Bottom down to the mouth of Neck Creek. There were groups of people along the river and in the better creek bends further west. They were seeking the rich tracts of land and big springs.

Q. Have you described the location of the first settlements along New River now? You mentioned some of them; I don't know whether there are any others?

A. I suggested the big springs; they were at the big springs, which were necessary for home places.

By Mr. THOMPSON:

Q. What do you call the big springs?

A. The unusual springs they selected first.

Q. That is no specific spot?

A. No; just like any family would; they couldn't dig wells, and they didn't at first, and there are many good springs in this southwest section. It is rather noted for that. These first home places were at these big springs. The broad meadows and in the
2045 creek bottoms lateral to the river, some of the best land is on these creeks, either where the creek comes into the river of further back towards the head of the creek. They found the best land—more especially at Horse Shoe Bend, below Radford, and Dunkards Bottom, above Radford, on Neck Creek and Back Creek, now in Pulaski County, and on branches of Reed Creek and Cripple Creek and Bingmans Bottom and Poplar Camp, just below the lead mines in Wythe County.

By Mr. JACKSON:

Q. Was Draper's Meadow one of the first settlements?

A. I thought I mentioned that.

Q. In the days of the early settlements, what were the routes of trade, travel, and transportation along the New River?

A. The earliest known route traveled was from the lower Virginia over the Blue Ridge towards the Cherokee Nation and the upper branches of Eastern Tennessee and western North Carolina. This trail was known to the English settlers as the Traders Path, a pretty well defined path. Across New River there was a ford, paralleling it a short distance above Reed Creek. That route is further south—parallel routes going in this same general direction.

Another further north and practically parallel was by the south branch of the Roanoke. The Roanoke divides just west of Salem, one branch called the South Branch and the other the North Fork. There were trails or routes of travel by both forks, and when they came to this fork they might go either way. The route up the South Branch crossed the river about Dunkards Bottom.

Q. When you say "the river" do you mean New River?

A. New River, yes. They would go by what is now Christiansburg, and from Dunkards Bottom it extended by Dublin Hollow, old Dublin Hollow, west over the divide between the waters of the New River and the Holston.

Still another route further north came up the Catawba Valley.

By Mr. THOMPSON:

Q. Where is that?

A. Catawba Valley is in Botetourt. Catawba Creek empties into the James River north of Buchanan. The old crossing down there was known as Looney's Ferry, and from there they came on up to what is known as Old Amsterdam in Botetourt County.

2046 That was the extension of the old Indian trail through the valley.

At Amsterdam this old trail divided, one branch extending west—that is very near the Catawba Ridge. It went up the Catawba, and went down North Fork of Roanoke.

The North Fork of Roanoke forms a hook. It goes down west from head of Catawba and turns east and this trail went west down the North Fork to the dividing ridge, and then went up over this ridge to New River to Draper's Meadows, and then on to the river.

That North Fork road, as we call it, connected with this South Branch road I was telling you about a few minutes ago that went up South Branch and on up the North Fork.

The other division of that valley trail, coming through Shenandoah Valley and Amsterdam, swung south across the Roanoke Valley by the Great Lick, the present Roanoke City, and extended on south into Carolina.

That became the great road from the Yadkin Valley, in Carolina, to Philadelphia, and it was an important trail.

That is one of the reasons people came through the valley into this section: it was a pretty well defined Indian road, and a road followed generally by people coming south from Pennsylvania and Maryland.

Now, we have got the trail and path over here: we have got the route from South Fork and by Salem and by Christiansburg, and

then further north from Looney's Ferry by Amsterdam and to Catawba.

Going back to the present Augusta County, from Staunton the settlements extended west, as well as south west, and they struck these western rivers like the Cowpasture and the upper James. Up about Clifton Forge there were a number of important settlements along the James River there. They crossed Craig Creek Valley and also the Catawba. They might come up the Catawba Road and might come up Craig Creek.

In case they went up Craig Creek, they would go down Sinking Creek, and then to Walker's Creek, and then down river.

By Mr. JACKSON:

Q. By "river", do you mean New River?

A. Yes, sir, and there they might go up Walker's Creek or swing down the river to the mouth of East River and to
2047 the west up East River towards the headwaters of the Clinch.

There are a number of these parallel routes of travel through each one.

2048 We can carry that still further—from present Clifton Forge, and they would go out through the present Monroe County, to Rich Creek.

Q. You said that this route, after coming to Walker's Creek, divided, one branch going along west, along Walker's Creek, and the other branch down to East River: Where did this branch that went from Walker's Creek to East River run with relation to New River?

A. It followed down the river. They branched off down the river.

Q. Did this route from Walker's Creek down to East River follow the land or the water?

A. We are speaking of overland travel.

By Mr. THOMPSON:

Q. What period?

A. The earliest period.

By Mr. JACKSON:

Q. Do you mean by that, the routes you have been describing are land routes?

A. Yes, sir.

Q. Mr. Kegley, state, as briefly as you can, how the New River was crossed on those routes?

Before stating where these routes that you have described crossed New River, will you state the sources of your information?

A. The sources for the early exploration or discovery of New River are the journals of the expeditions printed in First Explora-

tion of the Trans-Alleghany Region, by the Virginians, 1650 to 1674, by Alvord and Bidgood.

By Mr. THOMPSON:

Q. That is, two of them wrote it?

A. Yes, sir; it is a book of joint authorship.

By Mr. JACKSON:

Q. Is that a publication of journals?

A. I believe I prefaced it with that remark.

Q. How is this collection of early journals regarded among historians as to reliability?

A. The journals speak for themselves.

Q. I am asking whether or not historians regarded these journals as credible, or not?

A. Yes.

2049 Q. Now, will you proceed to state authoritities that you have considered in arriving at your testimony in regard to these earlier routes of trade and transportation and the places of crossing New River?

A. My first authority on location is land records themselves.

Q. What land records, and where are they?

A. Petitions for land first and then the grants of land by Councils and Government, and records in the Virginia Land Office, and surveys and deeds and orders of courts of the local counties—first, Orange and Augusta, and later Botetourt, Fincastle and Montgomery. We have the records preserved. Then Montgomery and Washington.

Q. Have you examined any old road records, or are these the ones to which you refer?

A. Road records come in the orders of the courts, petitions for roads, and, as at the present day, they quarreled about where they should be.

Q. Have you studied any maps or journals dealing with these subjects?

A. Maps are a favorite of mine. I studied early maps, and especially maps setting forth the extent of the Indian settlements in America, and British maps are valuable, and definitely locate certain routes of travel.

Mitchell's map of 1755 is especially valuable. If you want the complete title, it is Mitchell's Map of the British and French Domains in North America, dated 1755. It was made and produced about the time of the quarrel becoming so acute between England and France about the colonies.

Q. Have you studied any histories of the early settlements?

Q. Of course, a great deal of history has been written. Those histories are, we consider, secondary sources. Now, if you care

for a line of histories in the southwest section, I will be glad to give them to you.

Q. Not so far as I am concerned.

Mr. THOMPSON. Yes, we would like to hear them.

A. Starting with this book of Alvord and Bidgood for the period of exploration, and then following with Waddell's Annals of Augusta County, and Chalkley's Abstract of the Records of Augusta County. If you are not acquainted with this, it is a three volume publication. It is published by the Daughters of the American Revolution. It contains abstracts of the Orders of courts, one volume; abstracts of the deeds and wills and court judgments; and the other volume is pretty generally taken
2050 up with decisions, cases in court. There was a great deal of legal controversy about some of the early land titles. That is considered a very valuable work. It is a firsthand source of material.

Q. In connection with these roads, did you, or have you, examined or studied the Colonial Assembly Records, or records of the House of Burgesses?

A. Yes, sir. Henning's Statutes at Large are a good source for this early period, and the Journal of the House of Burgesses. Those things are all good sources. And then following on we have Morton's History of Rockbridge County, covering that period; also Morton on Monroe County, Alleghany County, Bath County, Pocahontas, Preston and quite a number of counties. Then farther west we have, covering the whole period, Summer's Annals of Southwest Virginia, which is a publication giving abstracts and orders of Court, deeds, land surveys—land surveys should be first—Botetourt, Fincastle and Wythe, that is the original stuff, just like the original records like Chalkley, then Summers again, "The History of the Southwest, Washington County."

Q. Have you examined any of the Journals and letters of early settlers and travelers?

A. There are journals of travelers into this region, and through it to Kentucky. There are depositions that bring out facts about travel and military expeditions.

By Mr. THOMPSON:

Q. He asked if he had examined them.

A. Yes, sir.

By Mr. JACKSON:

Q. Will you state how New River was crossed by these routes of transportation you have already described?

A. New River was crossed by fording, as they came to it, if they could find a ford.

They did cross it on boats. They had ferries where they needed them. They came to the river and where they had developed a crossing, but they naturally found fords first.

Q. Please indicate, briefly, some of the principal cross-
2051 ings, the location of them?

A. Let me read you this: "By fords at first, but later ferries were established." Most of the traveling public used these crossings in their western migration for settlement.

By Mr. THOMPSON:

Q. Are you reading a quotation?

A. No, sir; my own statement.

A. (Continuing.) And later they used these crossings for the transportation of their products to eastern markets with reference to increasing trade and travel along these routes. Ferries were established at most of the fords. Main roads crossed at mouth of Wilson, Daughton Ford, near Independence in Grayson County, Island Ford in Grayson County, Porter's Ford and Ferry near Ivanhoe, Wythe County, at the Lead Mines in Wythe County, at Herbert's, later Jackson's Ferry; the road toward Carolina south from Wythe County, at Barren Springs, Howard's, Allison's, Jones, Kinkous', Towe's, Godbey's, Dunkards Bottom, Ingles', Taylor's, below Radford, Pepper's, Cowan's, Brown's Farther down [interrupted].

Q. These are all below Radford, are they?

A. Yes, sir; these latter ones, Goodwin's, Snidow's, French's, Adair's—French's is about the Narrows and Adair's below the Narrows at Shanklin's, Pack's, and Bowyer's.

By Mr. JACKSON:

Q. Mr. Kegley, what was the earliest industry on New River?

A. The earliest industry was the mining of lead, manufacture of lead on New River in present Wythe County, and present Austinville. Lead has been produced there from about the year 1756, and was used through the French and Indian War, and for the local inhabitants' individual use, and for the Revolutionary War, and for the war between the states.

Q. Do you know what was the route of transportation in early times to and from the Lead Mines?

A. The Lead Mines were on the river above the crossing of the Trader's Path I spoke of, and it went out from there over, the road developing from that toward Richmond and Petersburg, and it also went by Ingles' Ferry, Christiansburg, Buford's Gap, east of Roanoke.

2052 By Mr. THOMPSON:

Q. Are you now describing a continuous road?

A. Yes, sir; toward Lynchburg, from the upper river, the Lead Mine region.

Q. From the Lead Mine down to Ingles' Ferry and then to Christiansburg?

A. Yes, sir.

Q. And then to Lynchburg.

A. This general route that is still traveled.

By Mr. JACKSON:

Q. What was the relation between this road east from the Lead Mines as far as Snowville and New River, how were they situated with respect to each other?

A. They followed practically parallel, with the river; they swung away at places over some of the ridges, but when it came to Snowville, that is the east side of the river, it would extend either to Christiansburg or south toward Petersburg, over the Trader's Path, on the west side of the river from the Lead Mines. It came down across Ingles' Ferry.

Q. Mr. Kegley, do you know what the routes of travel from the upper settlements on New River to those lower down on the river were in the early days?

A. From the upper settlements Reed Creek and Cripple Creek present Wythe County, and from present Pulaski County, any passing down the river on the west side of the river would have been across the ridge between Back Creek in Pulaski County, and Walker's Creek, went through what is known as Shannon's Gap, Walker's Creek makes a bend and swings north some distance, thence down Walker's Creek and came to what is present Pearisburg and on through the Narrows.

Q. What was the relation between the road you mentioned through the Narrows and New River, in the matter of location, how were they located with reference to each other?

A. Like I stated, it followed practically parallel with the river.

Q. Mr. Kegley, in this connection, did you consider or study any historical sources or authorities beyond those you have already mentioned?

A. Any authorities?

Q. Yes.

A. Oh, these I gave you, Mitchell's map for the location of the Trader's Path, the Preston and Virginia papers, the
2053 Draper manuscript collection and the letters of the State Historical Society of Madison, Wisconsin, are valuable letters.

That is a valuable source of material.

Q. Are those original documents?

A. Original documents of various kinds. In this connection "Johnson's Middle New River Families" [interrupted].

Q. Is that families or settlements?

A. It is settlements, and also Harmon's Annals of Tazewell County, and Pendleton's History of Tazewell County, also are very good authorities.

Q. What was the line of communication and travel in early days connecting the valley of the Kanawha River with the upper valley of the James River?

A. Let us think of it going the other way. Connecting the upper valley of the James with the Kanawha or lower valley west, the earliest trend of settlement and travel was that way. This was always the route traveled in that direction say from present Covington, mouth of Dunlap's Creek at Jackson's River, extending over the Alleghanies toward Ohio, and that route has been developed first with primitive roads and then improved roads, and practically the same route is used yet, and known as the Midland trail.

Q. Can you state what was the western terminus of that road in the early days, before 1800?

A. Aiming at the lower Kanawha Valley t' . road, the first road, seemed to terminate about Kelly's Creek.

Q. About when was that constructed, if you know?

A. The record of construction is about 1786.

Q. You said the western terminus was at Kelly's Creek. Where was that?

A. About twenty miles above Elk River, above present Charleston.

Q. Well does history disclose how travelers proceeded, if at all, farther west f. m Kelly's Creek, in the early days?

A. Numerous references are made to using the river from that point on, they might continue the road, in fact continued on to Elk Creek, and finally to the mouth of Big Sandy and also to Point Pleasant, but there was travel on the river.

2054 Q. You said the river, what river do you refer to?

A. The Kanawha River.

Q. Mr. Kegley, during the period say prior to 1860, what were the traveled routes from the upper New River valley to the east?

A. That would be practically the same development we spoke of, with a road to Wythe by Pepper's Ferry, thence to Blacksburg and Buchanan connected with the Jackson River, that road was improved, and then from Wytheville to Newbern, across Ingles' Ferry—Newbern is the old county seat of Pulaski County—Pulaski city is on the railroad farther north, across Ingles' Ferry,

thence to Lynchburg, that was improved—the Salem-Lynchburg turnpike, and finally macadamized, and there were other roads; the road to Cumberland Gap, down East River, and thence to Blacksburg, that was improved, and became known as the Old Cumberland road, they called these roads the "old stage roads," the "Baltimore road," and "Market road" and so on.

Q. This Cumberland road after it came down East River to New River, then it went to Blacksburg from East River toward Blacksburg—what was the relative position of this road and New River?

A. For that distance the road was not parallel but it was the same general direction; it was following east, the road runs rather northeast; the river runs practically north there I guess.

Q. For the period say prior to 1860 what was the situation with reference to lines of transportaion from upper New River down into the lower New and Kanawha River valleys?

A. These routes, of which we spoke before, went through the turnpike stage of development.

Q. I mean the location, if you have not already described that.

A. It was the same route known now as the Newbern-Red Sulphur turnpike, from Newbern to Red Sulphur Springs?

Q. Did it go any farther down than Red Sulphur Spring?

A. That road was developed and followed a few years later by extension, and that was known as the Giles, Fayette, and Kanawha turnpike.

Q. Can you give the location below Red Sulphur, what route did it take?

Mr. THOMPSON. Are you testifying from what you have
2055 learned from history prior to 1860?

A. I get it from the maps of the roads, from the histories of the counties through which it passed, and I can show you a map of the road if you want it.

The location of that road along the route of the road mentioned, thence down Indian Creek crossing New River at Pack's Ferry; thence along the west side of the New and Kanawha River to the Ohio, by the way of Fayette Court House and Charleston, where it connected with the Midland trail, the two roads came together there at Charleston, and the old Midland trail crossed the river there and joined this Kanawha and Fayette turnpike, went on to Big Sandy, and later a road went on to Point Pleasant, and still another road, or rather a cross road connecting those two, known as the Princeton and Red Sulphur Turnpike, coming down Lick Creek, crossing New River, that was farther south.

Q. Mr. Kegley, in the period prior to 1860 what was the situation with reference to the through roads on the east side of the New River from the upper James river valley?

A. There again the James river and Kanawha turnpike had been completed from the Jackson river to the great falls of the Kanawha following the course of the present Midland trail, and a road had been completed up the Dunlaps Creek by way of old Sweet Springs and Union, connecting with roads leading to the Red Sulphur Spring. My authority for that is Morton's Monroe County and Alleghany County."

Q. What, if any instances does history record of the use, or attempted use, of New River in early times as the means of travel or transportation?

In answering that question, just name the instances so as to identify them, if there are any?

A. The earliest illustration of the use of New River, or the waters of New River, for traffic or transportation, is the attempt of John Peters Salling, the early spelling seems to be Sally.

Q. What is that date?

A. 1742.

Q. What historical evidence is there of the trip of John Peters Salling or Sally in 1742?

2056 A. We have the journal, the transcript, of Salling, describing his experiences in travel on the river.

Q. Is that journal of Salling's generally accepted by historians or not?

A. The journal speaks for itself. Any original document of that kind is accepted by historians. You cannot do otherwise.

Q. Mr. Kegley, just state very briefly the route followed by John Peters Sally and his experience as disclosed by history?

A. In the account of this, the attempt is indefinite on the point of entering New River and leaving it [interrupted].

By the COURT. What is the answer?

I said it is indefinite as to where he entered the river and where he left it, no way to fix exactly from the wording of the journal; the description of his experiences on the river are definite.

Q. State briefly what they were?

By the COURT. Approximately about where did he enter?

A. The interpretation of Virgil Lewis' history archives of West Virginia Historical Society, says about the middle of the river, is the term he used, here about Blacksburg or Radford, and came out through the Roanoke valley.

By Mr. THOMPSON. Did he state Blacksburg or Radford?

A. I don't know, he used those words. Mitchell terms that the middle of the river, and that has been the theory of historians, as far as I have learned, they came out through the Roanoke valley.

By Mr. THOMPSON. In this journal does it say the Roanoke valley?

A. No.

(Colloquy of Counsel.)

By the WITNESS. This was in the year 1742 and undertaking to explore the western country.

By Mr. JACKSON:

Q. What, generally, was his experience on the river? Did he leave the river or what did he do?

A. Why not read this excerpt?

Q. You have a quotation from which you would like to read?

A. Yes, sir.

Q. What is the quotation from:

A. From this journal.

2057 Q. From Salling's journal?

A. Yes, sir.

Q. Will you read the part you deem pertinent to the point?

A. In this journal he said: "On the 16th of March" [interrupted].

By Mr. THOMPSON:

Q. What page of the journal is that from?

A. I do not have the page.

By Mr. JACKSON:

Q. Mr. Kegley, I show you an issue of the Virginia Magazine of History and Biography and ask if that is a reprint of the Sallings' journal, issue of April 1922?

A. It is.

Q. Will you read the quotation you deem pertinent?

A. I don't think you will find it different from the other.

Q. What page of the magazine is that on?

A. Page 213, April 1922. "On the 16th of March 1742, we set off from my house and went to Cedar Creek, about five miles where is a natural bridge over said creek, reaching from the hill on the one side to the hill on the other. It is a solid rock, and is 203 feet high, having a very large, spacious arch, where the water runs through. We then proceeded as far as Mondongachate, now called Wood River, which is 85 miles, where we killed five buffaloes and with their hides covered the frame of a boat; which was so large as to carry all our company and all our provisions and utensils, with which we passed down the said river 252 miles as we supposed, and found it very rocky, having a great many falls therein, one of which we computed to be thirty feet perpendicular, and all along surrounded with inac-

cessible mountains, high precipices, which obliged us to leave said river. We went then a southwest course by land 85 miles where we came to a small river and there we made a little boat, which carried only two men and our provisions. The rest traveled by land for two days and then we came to a large river where we enlarged our barge so she carried all our company and what ever loading we had to put into her."

Q. Have you completed the quotation you wish to read?

A. This is Fairfax Harrison's article, subject, "The Virginias on the Ohio and Mississippi, 1742."

2058 Q. What you have read, however, is a quotation from the Salling's journal?

A. Yes, sir; Harrison gives the introduction to the journals of Howard, Hayward, and Salling and then gives the quotation.

Q. At the end of the quotation you have just read, there was a reference made about coming to a large river. What do historians record as being the river mentioned?

By the COURT. Have historians given any consideration to that diary or journal and made an attempt to figure out what that second river was that he mentioned?

A. You mean the large river?

Q. Yes.

A. He says in the next sentence or gives some interpretation of where it was: "We went down this river 250 miles, tolerably good passage," so he must have referred to the Kanawha and Ohio. You asked me about historians generally. I want to say this is frequently quoted and I think all historians use it as an illustration of experiences in exploration.

Q. Is it generally believed the river mentioned was the Kanawha or the Ohio?

A. Yes.

By Mr. JACKSON:

Q. Now in addition to this trip of General Peter Sallings (Salley) in 1742, does history record any other instance of use or attempted use of New River, in early times, for trade, transportation, and travel?

A. The next illustration of travel on the river comes in the reports of the Commission on the James River Canal project.

Q. What Commission was that?

A. The so-called Marshall Commission appointed by the General Assembly to investigate the possibilities of connecting the waters of James River with the western waters, of New and Kanawha, and this comes in the report of Moore and Briggs, surveyors or engineers.

By Mr. THOMPSON:

Q. You say the Marshall report comes in there?

A. The next example comes in the report of this commission and then following that experience the Moore and Briggs report
2059 made under the Board of public works of Virginia.

By Mr. JACKSON:

Q. Now, you have mentioned the Salley trip and the survey of the John Marshall Commission, which is in evidence, or the report is in evidence here, and the survey of Moore and Briggs in 1819 or their report which is also in evidence here. Does history record any other instances of use or attempted use of New River in the early times as means of Trade, transportation, and travel?

A. Those are the two instances of travel recorded.

Q. Two, you say?

A. Yes, sir; the Salley trip and this Commission, and the account of Moore and Briggs or their report, and that would be three.

Q. Now Mr. Kegley, does history record instances of other trips in early times down the New River Valley or from the region of upper New River. Just answer that yes or no?

A. Yes, sir.

Q. State whether or not history discloses an expedition against the Shawnee Indians authorized by Governor Dinwiddie in 1756, during the French and the Indian War. Just answer that question yes or no.

A. Yes.

Q. Please state briefly the nature of that expedition, the route it followed, and the means of transportation employed?

A. It was in February 1756, that Governor Dinwiddie, then Governor of Virginia, authorized and planned against the Shawnee Indians an expedition, whose chief town was near the mouth of the Great Kanawha.

This expedition was under command of Major Andrew Lewis, who assembled the men designated to go at Fort Frederick.

By Mr. THOMPSON:

Q. What are you reading from now?

A. I am reading a statement of my own.

Q. Is it a digest from some history?

A. Yes, sir; various histories.

(Colloquy of Counsel.)

By the WITNESS. Leaving Fort Frederick, at Dunkards Bottom on New River, they went west through Burks Garden, now in Tazewell County.

By Mr. JACKSON:

Q. Would that be over land?

2060 A. Yes; then to the east fork of Big Sandy, generally known as Tug Fork.

By Mr. THOMPSON:

Q. Where is that?

A. In the present McDowell County, West Virginia, just north of Tazewell County. That was the next valley they came to. They then went through Burks Garden to the east fork of Big Sandy, and after they proceeded down this stream for a time, the expedition disbanded because of difficulties.

Q. Where does the Big Sandy come in?

A. This is the east fork of the Big Sandy, and the Big Sandy comes into the Ohio.

Q. It does not come into New River?

A. No, sir; the idea was to get back to the Ohio.

By Mr. JACKSON:

Q. Will you please state some of the historical sources which you studied in connection with this expedition of 1756, authorized by Gov. Dinwiddie against the Shawnee Indians.

A. The Dinwiddie papers themselves are published and give the letters and orders to the Commander of the Expedition, suggesting a method of carrying it out. Aside from that, we have the diary or journal of William Preston, who was one of the Captains of the Company. This journal is published in Johnson's History of the Middle New River Settlements, and that is taken from the Draper Manuscript Collection, but it is printed in this history of the Middle New River Settlements by Johnston. If you want the page you can get it.

By Mr. THOMPSON:

Q. Will you give us the page?

A. No; I cannot give it to you right now, but we have it here.

By Mr. JACKSON:

Q. Did you find anything about this expedition in the journal of the House of Burgesses?

A. The journal of the House of Burgesses contains a number of statements and records in regard to the conduct of the men on this expedition and the difficulties encountered. It shows further why they disbanded.

Q. Does history record an expedition of Virginians against the Indians on the Ohio River in 1774?

A. Yes.

2061 Q. Will you please state briefly the nature of that expedition, the route which it followed and means of transportation employed?

A. That is generally termed the point Pleasant Expedition. This expedition was brought on because of the hostility of the Indians following the advance of the settlements towards Kentucky, in years from 1768 to 1774. As the settlements were advancing, the Indians were aroused, and this expedition was planned by Virginians against the Indians on the Ohio River, to meet them for combat. The soldiers from the southwest were commanded by Col. Andrew Lewis, the same man, but he was a Colonel at this time, with Col. William Christian in charge of the Fincastle troops. The Fincastle troops were from Fincastle County, which then included the territory west of Alleghany Ridge, New River, Holston, and Clinch settlements, and Kentucky. The place of rendezvous for the western division was at William Thompson's, on Back Creek, now the Cloyd Plantation in Pulaski County.

Q. Where is that with reference to the river?

A. That is not far from New River—within a few miles of the river. From that point they proceeded down the Valley of the New River, by land, carrying their provisions on pack horses, but their course was generally parallel with the river, which they crossed——

By Mr. THOMPSON:

Q. Are you reading from some history now?

A. No, sir; I am reading an outline I have here.

By Mr. JACKSON. Go ahead.

A. They crossed New River and proceeded towards Greenbrier.

By Mr. THOMPSON:

Q. Can you state where they crossed the river?

A. No, sir; but the camp on the Greenbrier was known as Camp Union, about the present Lewisburg. They proceeded on towards Ohio, fording the Gauley River, and came to the mouth of Kelly's Creek, about 20 miles above where Charleston is now.

By Mr. JACKSON:

Q. The mouth of Kelly's Creek is on what river?

A. On the Kanawha. I believe they said they came to the Kanawha at Kelly's Creek. A few days later when they arrived at Elk River the officers were requested to report the num-

2062 ber of men in their respective companies, who were willing to be employed in making canoes, and all tools were ordered to be put in working order. Two brigades of horses were sent back to Camp Union for flour for the men who were employed in making the canoes.

By Mr. THOMPSON:

Q. Was this on the Kanawha River now?

A. On the Elk River.

Q. It was not on New River?

A. No, sir. The next day the scouts for the mouth of Kanawha launched their canoes. They were scouting for information. Two days later the troops most accustomed to conducting canoes were ordered to be collected and the canoes fitted out for receiving their loadings with all possible dispatch. Proceeding down the river, a Sutler's Canoe overset and two guns and some baggage were lost.

Two canoes that were fastened together were overset and 27 bags of flour were floating.

By Mr. JACKSON:

Q. Now will you please state what historical sources, if any, you studied in connection with that trip, in addition to that, not heretofore mentioned?

A. The authority for this Point Pleasant Expedition are letters and journals, and original documents printed in what is called Dunmore's War; they are documents taken from the Draper Manuscript, collection and date by Dr. Thwaites and Louise Kellogg. The full name of this book is the Documentary History of Dunmore's War.

By Mr. THOMPSON:

Q. Was that called History of Dunmore's War?

A. Yes; it is documentary history of Dunmore's War.

By Mr. JACKSON:

Q. May I just interrupt you a moment here, to ask if these documents are compilations of original letters and journals?

A. Yes.

Q. Were those journals and letters written by the men who were on this expedition?

A. Yes, sir.

Q. Are they generally accepted by historians as trustworthy evidence of this expedition?

A. Yes.

2063 Q. Mr. Kegley, does history record a trip made by Charles Johnson of Botetourt County and one John May to Kentucky about 1790?

A. It does.

Q. Is there any historical account of that trip?

A. We have Johnston's own account of that trip to Kentucky in company with John May.

Q. And has that account been published?

A. Yes; we have this account which has been published. Do you want the title of that?

Q. Yes; give the title.

A. The title for that publication is "Incidents attending the capture, Detention, and Ransom of Charles Johnston, of Virginia," published by J. and J. Harper, in 1827, and a reprint by the Burrows Company in 1905.

Q. Is Johnston's account of his trip to Kentucky in 1790 generally accepted by historians as a trustworthy account of that trip?

A. It is his own account.

Q. Mr. Kegley, will you describe briefly this trip, the route followed by Johnston and May and means of travel which they employed?

A. Johnston said "we proceeded by the usual route to Greenbrier Courthouse——"

By Mr. THOMPSON:

Q. Are you quoting now from some document?

A. From Johnston's book.

Q. What page?

A. I haven't the page.

By Mr. JACKSON:

Q. Mr. Kegley, is the book here?

A. I don't think I have that book here. It is available, however, in Roanoke if you want it.

Q. Now will you please proceed with your quotation?

By Mr. THOMPSON. I would like to know the page from which you are reading. Will you produce the book?

A. I cannot do it now.

By Mr. JACKSON. We will do it if we can.

By Mr. JACKSON:

Q. Mr. Kegley, please proceed.

A. Johnston says "we proceeded by the usual route to Greenbrier Courthouse, where the town of Lewisburg has since
2064 been built, which place we left about the 8th or 10th of March. The country between that place and the Kanawha River, on which we were to embark, was then destitute of inhabitants, and the distance, about 80 miles. We toiled on through a dreary country and unpleasant weather for two or three days longer and then arrived at Kelly's Station on the great Kanawha. There we contracted for one of those heavy, clumsy, slowly moving structures, at that time employed on the Ohio for the conveyance of travelers and their property to the western settlements." That is all that is pertinent to this question.

Q. That quotation which you read refers to Kelly's Station. Have historians been able to locate that definitely?

A. Yes.

Q. Where was it?

A. Kelly's station is at the mouth of Kelly's Creek about 20 miles above Elk's River, above Charleston.

Q. Earlier in your testimony I think it was about the Dinwiddie expedition of 1756, you made some reference to the Big Sandy River. Will you tell me whether the Big Sandy River flows into the Ohio above or below the Kanawha River?

A. It is below the Kanawha River.

Q. Does History record a trip by Moses Austin from Austinville, Va., to Missouri and Texas in 1798?

A. Yes.

Q. What is the historical evidence, if any, of that trip?

A. We have an account of that trip from Austin's Journal printed in an introduction to the Austin Papers which were published as a report of the American Historical Association in 1919, edited by Dr. Barker of the University of Texas.

Q. Is that journal an account of the trip written by Moses Austin himself?

A. Yes, sir.

Q. And does it record his observation during the course of that trip?

A. Yes, sir.

2065 Q. And is that journal accepted by historians as reliable and credible evidence with respect to that trip?

A. It is acceptable, it is his journal.

Q. Is it accepted as reliable?

A. Moses Austin was certainly a reliable man.

Q. Will you please state briefly the route followed by Moses Austin and his party, and the means of transportation or travel employed?

A. In this journal he says that he and his family and certain other persons, with nine loaded wagons and a coach and four horses left Austinsville and took the road to Morris' Boat Yard on the Great Kanawha, having started the trip on the 8th day of June 1798.

By Mr. THOMPSON:

Q. Are you reading from his journal?

A. No, sir; from a summary of my own.

This Morris' Boat Yard is Kelly's Station, at the mouth of Kelly's Creek. Morris succeded him at that place. He further says that on the 4th day of July, he entered the Ohio, and arrived at Kaskashaia on the 8th day of September, sick and debilitated

to such a degree that out of 17 persons that arrived, two only could walk on shore from the barge.

By Mr. JACKSON:

Q. Did any of the usual routes of trade and travel from or through the New River country, in early days, to Kentucky and Ohio, lead through the Kanawha Valley?

A. Yes; there were different roads of travel to Kentucky.

Q. Did any of them lead through the Kanawha Valley?

A. Yes, sir.

Q. Will you describe that route of trade and travel briefly, and the means of transportation employed?

A. The early road to Kentucky went by way of Ingle's Ferry through Cumberland Gap, and another went by Fort Pitt down the Ohio, and still a third generally used for travel, they used the route that went down the Kanawha. They might either go on down the Kanawha by land or by water.

Q. Where did they reach the Kanawha?

A. They reached it over that western road from James River across on down.

2066 Q. At what point did they reach the Kanawha?

A. The road came to the river at Kelly's Creek and at Charleston.

Q. At that point, what was the means of travel from the east?

A. The means of travel from the east was overland.

Q. From that point on what were the means of travel?

A. They either went by water or by land from that point.

Q. Mr. Kegley, was there any fort located at Point Pleasant in the early days?

A. After the battle of Point Pleasant, a number of soldiers continued to be stationed there and garrisoned the fort, which was called Fort Randolph.

Q. When was it established?

A. In 1774.

Q. How long was it garrisoned?

A. That was continued from the Revolution as long as there was any hostility along the Ohio.

Q. How were supplies for Fort Randolph transported to Point Pleasant?

A. The garrison was generally supplied with flour and salt by boat from Fort Pitt; that seems to be the general way they supplied this fort and others on the Ohio.

Q. Did I ask you earlier what were the means of transportation to and from the lead mines in the earliest days, or not?

A. You asked about the routes to the lead mines. The only history we have on that is the overland route; the one over the

so-called Lead Mines Road, which lead to lower Virginia by formerly the Old Trader's Path, and the other over Ingle's Ferry—the road by Christiansburg and Salem.

Q. Have you finished your answer on that?

A. Yes, sir.

Q. Mr. Kegley, did Thomas Jefferson visit New River in the early times?

A. Thomas Jefferson, after he was Governor of Virginia, visited the New River and the lead mines. He had been interested in the lead mines.

Q. What was the date of his visit?

A. 1780?

2067 Q. Did Jefferson write a description of New River as he observed it at the time of his visit?

A. Yes, sir.

Q. And was that description published?

A. Yes, sir; it was published in his "Notes on Virginia"—Jefferson's "Notes on Virginia," pages 11 and 23 and 24.

Q. What is the reputation of Jefferson's description of New River among historians? Is it generally accepted by historians?

A. I would say that Jefferson speaks for himself.

(Colloquy of Counsel.)

By Mr. JACKSON:

Q. I will ask that the question be read.

(The question is read.)

A. Yes, sir.

Q. Will you please read Jefferson's description of New River in 1880, as it appears in his "Notes of Virginia?"

By Mr. THOMPSON. You mean 1780?

By Mr. JACKSON. Yes, sir; 1780?

A. (Reading:) "The Great Kanawha——

By Mr. THOMPSON:

Q. Are you reading a quotation?

A. I am reading from notes.

Q. You are reading notes?

A. His notes—his Diary—his description of the Great Kanawha. [Reading:] "The Great Kanawha is a river of considerable note for the fertility of its lands, and still more as leading towards the headwaters of James River. Nevertheless, it is doubtful whether its great and numerous rapids will admit of a navigation, but at an expense to which it will require ages to render its inhabitants equal. The great obstacles being at what are called the Great Falls, 70 miles above the mouth, below which are only five or six rapids, and these passable, with some difficulty, even at low water. From the Falls to the mouth of Greenbrier is

100 miles, and thence to the lead mines 120 miles. It is 280 yards wide at its mouth."

By Mr. JACKSON:

Q. Do historians identify the Great Falls referred to by Jefferson?

A. The Great Falls of the Kanawha are understood to be the Falls below the lower falls.

By Mr. THOMPSON:

Q. Did Jefferson say that?

A. No, sir; he said the Great Falls were about 80 miles from its mouth.

Q. Does that mean 80 miles from the Ohio River?

A. Yes, sir. He says the distance on the river to the Great Falls was 70 miles.

2068 Q. Then this description that you are reading is a description as you saw it from Jefferson's Diary—his account.

A. No, sir; it is a quotation.

Q. Is it the river from the Falls down to Point Pleasant?

A. Yes, sir.

Q. (Continuing.) that he is referring to?

A. The distance—"the great obstacle begins at what are called the Great Falls 70 miles from the mouth." I thought that was clear.

By Mr. JACKSON:

Q. Mr. Kegley, is there any other quotation from Jefferson's Notes on Virginia with respect to the Kanawha, which you regard pertinent to the point. If so, read it.

A. Jefferson gives a good description of the lead mines on page 24. He says: "From the furnace, the lead is transported 130 miles along a good road leading through the Peaks of Otter to Lynch's Ferry, or Winstons on James River, from whence it is carried by water about the same distance to Westham. This land carriage may be greatly shortened by delivering the lead on James River above the Blueridge, from whence a ton weight has been brought on two canoes. The Great Kanawha has considerable falls in the neighborhood of the mines. About seven miles below are three falls, of three or four feet perpendicular each; and three miles above is a rapid of three miles continuance, which has been compared in its descent to the great falls of James River. Yet it is the opinion that they may be laid open for useful navigation so as to reduce very much the portage between the Kanawha and James Rivers."

By Mr. THOMPSON:

Q. What page is that?

A. Pages 23 and 24.

By Mr. JACKSON:

Q. In your historical researches, have you encountered any other early descriptions of New River?

A. I found a description in Morse's Universal Geography?

Q. Published when?

A. It was published at Boston in 1802.

Q. Is that geography regarded as entitled to any credit in the description of conditions there?

2069 A. It is a universal geography, describing different countries in the world and America by States. This is under "Virginia."

Q. Will you read a description of New River as given in Morse's Universal Geography, published in 1802?

A. This is the quotation: "The Great Kanawha is a river of considerable note for the fertility of its land, and still more, as leading towards the headwaters of James River."

By Mr. THOMPSON:

Q. What page is that?

A. I do not have the page.

Q. Will you produce the volume, that you are reading from?

A. I can, but I cannot right now.

Q. Will you do that?

A. I cannot do it now.

Q. Well, after you get through.

By Mr. JACKSON. We will endeavor to get it for you.

By Mr. THOMPSON:

Q. At the noon recess?

A. No, sir.

By Mr. JACKSON. We will try to get it.

By Mr. THOMPSON:

Q. We would like to have it for our cross-examination—before we start our cross-examination.

A. (Continuing.) "Its headwaters interlock with those of Holston and Roanoke, and from a considerable distance from its source it is called New River. It is doubtful whether its great and numerous rapids will admit a navigation, but at an expense to which it will require ages to render its inhabitants equal. The great obstacles being at what are called the Great Falls 90 miles above the mouth, below which are only five or six rapids, and these passable, with some difficulty at low water. From the Falls to the mouth of Green Briar is 100 miles, and then to the lead mines 120. It is 280 yards wide at its mouth. The principal branches of the Great Kanawha, as you ascend it, are, Louis, or Coal Creek from the West—Elk, 60 miles from its mouth—Gauley River, more than 100—Green Briar, nearly 200. These three latter from the East."

Q. You are reading—that is practically a restatement of what Mr. Jefferson said, isn't it?

A. Yes, sir.

2070 On cross-examination, testified as follows:

Q. You stated that you come from Wytheville. Is that correct?

A. Wythe County, near Wytheville. That is the post-office address.

Q. Are any of your relatives employed by the Appalachian Electric Power Company, or have they been in recent years?

A. No, sir.

Q. Is there not a Mr. Kegley, who lives in Wytheville, that is an attorney employed by the company?

A. There is an attorney there named Kegley, but I don't know that he is employed by them.

Q. You don't know that he has ever been employed by the Appalachian Electric Power Company?

A. I do not.

Q. Is he a relative of yours?

A. Yes, sir; he is a cousin of my father.

Q. You were educated in the public schools in Wytheville, were you?

A. In Wythe County.

Q. And then you went to Roanoke College?

A. Yes, sir.

Q. And you got a degree of A. M. there?

A. A. B. and A. M.

Q. And then you took a degree of A. M.

A. Yes, sir.

Q. And then you went to the University of Pennsylvania?

A. Yes, sir.

Q. And you went there to get your Doctor's degree?

A. Yes, sir; I went there to study. I planned a Doctor's degree.

Q. And you spent two years there?

A. One year.

Q. And you did not get your Doctor's degree there, from the University of Pennsylvania?

A. No, sir; it takes three years.

Q. Wasn't that because they would not take your credits?

A. No, sir. My father's death necessitated my staying at home. They offered me a Fellowship to continue my studies.

2071 Q. So you went back home, did you?

A. Yes, sir.

Q. To Wytheville County?

A. Yes, sir.

Q. And you became an instructor in English in 1902 to 1905, at Roanoke College?

A. In English and History.

Q. Does Roanoke College give a Doctor's degree?

A. No, sir; they do not. They give a D. D., but they do not give a Ph. D.

Q. Could you not have gotten your Ph. D. degree during that time?

A. No, sir; I was teaching.

Q. Couldn't you have done it at the same time?

By Mr. JACKSON. We object to that, because he said they did not give that degree at that college.

By the COURT. I think he meant that he might have gotten it elsewhere.

A. I could not have very well done that and do what I did.

Q. I believe you have never received a Doctor's degree?

A. No, sir.

Q. How long did you state you had been farming?

A. I have been on the farm since 1912.

Q. And during that time you have been a farmer?

A. A farmer and a student.

Q. Can you be a farmer and a student at the same time and delve into matters of this kind?

A. Yes, sir; I have given most of my time to that—I have given most of my time to study, unfortunately for the farm.

Q. You have been telling the Court about the Draper collection?

A. Yes, sir.

Q. Draper was a resident of this part of the country before the War, was he?

A. No, sir.

Q. Isn't he the man that took it to the University of Wisconsin?

A. Yes, sir.

Q. And he came to this part of the country, didn't he?

A. Yes, sir.

Q. And did he collect all these various manuscripts that he could get?

A. Yes, sir.

2072 Q. And didn't he leave and go to Wisconsin?

A. Yes, sir.

Q. After the War?

A. Yes, sir.

Q. And didn't he leave all these documents with the University of Wisconsin?

A. Yes, sir.

Q. Have you been to the University of Wisconsin and gone over these documents?

A. Yes, sir.

Q. When?

A. I was there in the summer of 1908.

Q. How long did you stay there?

A. Six weeks.

Q. Do you mean to tell the Court that you could go over all those documents——

A. (Interrupting.) No, sir.

Q. (Continuing.) that are in that collection and make a study in six weeks?

A. They have an index of these documents—a comprehensive index, that gives a statement of the document—what they are and a brief description of them and this is published and known as the Preston-Virginia Papers, and from them you can tell exactly—not exactly, but you can tell what letter or document if it pertains to Southwest Virginia, and I have photostatice copies of that collection pertaining to Southwest Virginia, particularly of the Draper manuscript collection.

Q. Don't those who are considered hi orians and writing about this part of the country go to the University of Wisconsin to make such study?

A. No, sir; you can tell as much about it without going as you can if you go, especially if you have photostats of the documents.

Q. You don't have photostatic copies of everything up there, do you?

A. No, sir; everything that is there does not pertain to Southwest Virginia.

Q. Do you tell the Court that you have photostatic copies of everything up there?

2073 A. No, sir.

Q. That pertains to Southwest Virginia?

A. No, sir; I said a great many things.

Q. And there are a great many things you have not got, aren't there?

A. Yes, sir; there are some sure; I have gotten those things that seem most important.

Q. You say that you have written a book consisting of two volumes?

A. No, sir; one volume, so far.

Q. And it is with the printer now?

A. Yes, sir.

Q. Who is the publisher?

A. The publishers are the Southwest Virginia Historical Society and the printer is the Stone Printing and Manufacturing Company of Roanoke, Virginia.

Q. And are you paying for the publication of that book?

A. No, sir; it is a subscription arrangement, a cooperative project.

Q. By that arrangement, don't you agree to have a certain number of copies for which you will pay?

A. No, sir.

Q. Who is paying for it?

A. The subscribers.

Q. Have persons subscribed already for it enough to pay for the publication of it?

A. Practically; yes, sir.

Q. How many have you got?

A. I don't know the exact number; I don't handle that; about three hundred fifty.

Q. And that is all the work, as I understand you, that you have done, with respect to historical studies—you have written a book about this part of the country.

A. That is not all the work. I have done different kinds of work. I have done this research work and study and it has taken a lot of time.

Q. Do you speak as an independent historian or are you employed by the Appalachian Electric Power Company?

A. I am absolutely an independent historian.

2074 Q. And you are not retained by them in any way?

A. No, sir.

Q. You spoke of having read the records in regard to James River and the Kanawha Canal. What records did you read with respect to James River and the Kanawha Canal?

By Mr. JACKSON. We object to that because he did not state that he read the record.

By Mr. THOMPSON. I have it in my notes here that he read the record.

By Mr. THOMPSON:

Q. Did you read any?

A. I have read Marshall's Report—the report of the Marshall Commission.

Q. That report of the Marshall Commission, that was, I believe you said, the first account, or the first historical account going down the river?

A. No, sir; I said it was one of the first.

Q. That was what year?

A. 1812.

Q. 1811 or 1812?

A. Yes, sir.

Q. Do you recall—have you read the history of Summers County, West Virginia:

A. I have Summers County.

Q. Have you read that?

A. Yes, sir.

Q. Do you recall a trip down the river, as stated in this history, by a person named Loami Baldwin in 1817?

A. Yes, sir.

Q. You did not give that in your examination in chief, did you?

A. No, sir.

Q. Did you forget it?

A. I read that.

Q. Let me read this page to you (reading). "The New River country was visited by Chief Justice John Marshall, the Great Chief Justice of the United States, with other commissioners, who explored that stream in 1812. The report of these commissioners is a most interesting document.

An exploration was also made by Laomi Baldwin and party in 1815, in a boat 50 feet long, from the mouth of Howard's Creek in Greenbrier County, and down Greenbrier River to its mouth at Foss, a mile east of Summer's Courthouse; thence they turned up New River and proceeded to the mouth of Indian Creek; thence they returned down the river to the present site of Hinton, and thence on down New River to its mouth."

2075 Q. (Continuing.) Do you remember reading that particular part?

A. Yes, sir.

Q. Why didn't you state it on direct examination?

A. There is no objection to stating it. That could go with the report of Moore and Briggs.

Q. That would make four expeditions in these early days?

A. Yes, sir.

Q. I believe there is the Baldwin Expedition; the Marshall Expedition; the Moore and Briggs Expedition; and one other expedition which is the Sally expedition. Is that correct?

A. Yes, sir.

Q. And the Sally Expedition went down the River a distance of 250 miles in boats?

A. I didn't say that. They said as they conceived it.

Q. As they understood it?

A. Yes, sir.

Q. You accept that as credible?

A. No, sir. I think they did not know how far they went.

Q. I thought you were giving historical statements and you did think they were credible.

A. I was giving the historical statement they made.

Q. Some of these statements that you have read you have not exactly believed. Is that right?

A. Some particular phrases I might wonder at.

Q. You did not state anything about any phrases that you wondered at when you were giving your statement in answer to questions by counsel on the other side?

A. I gave the account as it was made. I gave the quotations.

Q. We are to understand—the Court is to understand, that you do not necessarily believe in all the facts in the statements that you have read here this morning?

A. As to that particular phrase, I think there might be some question.

Q. If you don't believe that, what other particular phrases are there that you don't believe in?

2076 A. I don't know. I don't recall any particular phrases now.

Q. Thomas Jefferson referred to the distance from the mouth of the Ohio up to Kanawha Falls, or the mouth as 70 miles?

A. Yes, sir.

Q. Do you agree with that?

A. That seems to be accepted, with the figures varying in different reports. Some say 85 or about 85, and some 70.

Q. Don't you know that it is 97 miles from the mouth?

A. I don't know how far it is exactly.

Q. When you accepted Jefferson's statement, you accepted it on its face value for historical investigation, didn't you?

A. I accepted it as Jefferson's statement gave it to you as that.

Q. What do you think of the statement from a historical point of view?

A. I could not say without measuring the river.

Q. Couldn't you go to Governmental sources in the State?

A. You might question some of the others.

Q. But you did not make a check. You have never tried to apply present-day data to check on any of these historical statements?

A. On any of them—I didn't say that.

Q. What is the answer?

A. I did not say that.

Q. I am asking if you did?

A. Yes, sir; I applied checks.

Q. But you did not in the case of Jefferson's statement?

A. No, sir.

Q. What checks did you make?

A. Well——

Q. (Interrupting.) Well, for example, let's take the Marshall report. Did you make any check on that?

A. You mean personal observation?

Q. Yes?

A. As to the accuracy of every statement?

Q. Yes, sir.

A. No, sir.

2077 Q. You didn't make any?

A. I took the report at its face value.

Q. And you took the other reports at their face value?

A. What else could you do?

Q. Is that what an expert historian does—take reports at their face value?

A. You would as an original document. If you based a conclusion on it, with a view to correcting it, you would have to check it.

Q. You have given a list of a number of trade routes?

A. Yes, sir.

Q. Have you made a check of these—an individual check with respect to those?

A. Yes, sir.

Q. What ones?

A. I have been over most of them personally.

Q. You have been over them and checked them with respect to the historical data that you have read here?

A. Yes, sir; I personally inspected them.

Q. You testified that there was a settlement at Dunkard's Bottom away back in approximately 1744.

A. I know definitely that it was there in 1745.

Q. Wasn't that the chief settlement in this whole district?

A. It was one of the chief settlements. There is a difference of opinion about that. It was one of the first. There were other settlements further down the river. There was a settlement at Draper's Meadows.

Q. Where did the Dunkards come from?

A. From Lancaster County, Pennsylvania. It was a religious sect in Lancaster and it has quite an interesting history.

Q. It has a very interesting history?

A. Yes, sir.

Q. And that was one of the few settlements that stuck there and was successful?

A. It stuck until it was molested by the Indians.

Q. Pennsylvania is in what direction—Lancaster—where is Lancaster, Pennsylvania.

2078 A. Lancaster is southwest from Philadelphia.

Q. It is very far in the eastern part of Pennsylvania, isn't it?

A. Yes, sir.

Q. And slightly southwest of Philadelphia?

A. Yes, sir.

Q. In getting to Dunkard's Bottom, they would be travelling, wouldn't they, in a direction that would be almost perpendicular to the direction of New River?

A. Generally; yes, sir, that general direction.

Q. So, in going to that New River settlement, there was no necessity for them either to go up or down New River?

A. No, sir; I think they took the attractive piece of land when they came to the river.

Q. That is an attractive piece of land?

A. Yes, sir.

Q. You say?

A. Yes, sir.

Q. Do you know whether or not the Dunkards used boats on the river?

A. No, sir; I don't know.

Q. You don't know that they did not, do you?

A. I found no reference to any boats used.

Q. You could not say that they did not use boats?

A. No, sir; I would not attempt to say that they did or did not, because there is no way to tell.

Q. So far as history is concerned—this history that you speak of, they may have gone up and down the river in boats?

A. They might.

Q. I believe you said that—I am not sure if I am correct—that there was established close by a ferry?

A. Yes, sir.

Q. The establishment of a ferry would indicate that the river had considerable depth for a period of years, wouldn't it?

A. Yes, sir.

Q. And that ferry was used by people going east and west?

A. Yes, sir.

2079 Q. What ferry was it?

A. The first ferry that was there was known as Scaggs' Ferry, above Ingle's Ferry, about Dunkard's Bottom. The old road kept south from Christiansburg along the ridge and crossed above the mouth of Little River and up the old Dublin hollow and came out at Newbern. You know the contour of the land there. It is easily understood why it was there at this place of Scaggs', who was one of the pioneers and had land along the river there at the same time the Dunkards were there. Scaggs sold out to a man named Whitt, who was one of the early pioneers, and the old Whitt Mill is still there at the mouth of Meadow Creek.

Q. When do you place that, what year?

A. About the ferry there, 1745 or 1750.

Q. Did the ferry continue there for many years?

A. Not very many.

Q. It moved down, did it?

A. It was succeeded by Ingle's Ferry.

Q. And that continued to be Ingle's Ferry?

A. To the present time.

Q. So that people coming east and west would naturally cross at Ingle's Ferry, would they not?

A. Yes, sir.

By the COURT. I notice on several of the maps of that section that you are speaking of that it is referred to as Dunkards' Bottom and on others as Dunkert's Bottom?

A. It is Duncards'—is the local spelling, but it is properly D-u-n-k-a-r-d and pronounced with a "T."

By the COURT. It is not a family name?

A. No, sir; it was a religious sect.

By the COURT. Yes; I am familiar with it.

A. They are good people.

Q. I wondered if it was the same name?

A. Yes, sir; they are a good people.

By Mr. THOMPSON:

Q. You located a number of ferries on the river, I believe?

A. Yes, sir.

2080 Q. I want to ask you about Reed Creek. I believe you said there was a ferry there?

A. Yes, sir; a ford and a ferry at the mouth of Reed Creek, known as Carter's Ferry. It was Tom Pierce's at first and he owned a tract of land there. Those ferries there are in the pools. Every ford had a ferry. You could not cross sometimes.

Q. And those ferries were for people crossing going east and west?

A. Yes, sir.

Q. And the migration at that time was towards Kentucky?

A. Yes, sir; Tennessee and Kentucky.

Q. And from the west—in other words, the migration came from the east and crossed the river to go to the west?

A. Yes, sir.

Q. So that there was no reason for people going up and down the river in the migration?

A. No, sir; there was not much reason.

Q. Because you said there was a ferry at Horseshoe Bend?

A. The first ferry there was at the mouth of Tom's Creek. That comes in as an order of the Court for a road in there—in the Orange County Order of the Court.

Q. Where would that be located?

A. It is located at the mouth of Tom's Creek, just west of Blacksburg or Drapers' Meadows, and the road comes to the river and they have a little island there and forded the river and had a ferry too, and the ferry is now known as Cowan's Ferry. Adam Harman lived there also and got a survey of 500 acres in 1750.

Q. Is that known as the Whitethorne Ferry?

A. Yes, sir.

Q. That was used by people going east and west, was it?

A. Yes, sir.

Q. You spoke of one at the Lead Mines?

A. Yes, sir; there was a ford up there, and a ferry.

Q. And that was for people coming there from what part of the country?

A. That was the main Carolina route. They had a turn-
2081 pike road from Wythe Courthouse to Danville, across there at Thorne's Ferry. That was Lynch's Ferry and they forded the river at the Falls at the mouth of Mill Creek, but used the ferry—there was a ferry there at Charles Lynch's and a tract known as the Lead Mine tract at the mouth of Mill Creek, and they asked for a franchise there. That was in 1787.

Q. That was continued, was it?

A. That ferry is still there and belongs to the land on the west side of the river. Later on, Thomas or James Newell got that land and he was superintendent at the Lead mines after the Austins left, and one of the successors claimed the ferry. The matter was put in Court and the decision was that it belonged to the land on the west side.

Q. Is that all the ferries that you gave on your direct examination?

A. Did I give all the ferries?

Q. Yes. You gave Reed Creek and Dunkard's Bottom and the Horseshoe and the Lead Mines.

A. I didn't know that I gave them all.

Q. Were there any——

A. (Interrupting.) I gave a number on down the river, on down, the main ones.

Q. As far as Bowyer's Ferry—that stretch of road came from Covington to Lewisburg and from Lewisburg to Bowyer's Ferry?

A. There was at one time a road that crossed there that connected with the road between Giles and Fayette and Kanawha Turnpike to the James River and the Kanawha Turnpike. It led across the mountain and crossed the Greenbrier and went to Bowyer's Ferry.

Q. That is what we would term a mesa or tableland, isn't it?

A. On the west side of the river; yes, sir.

Q. And was an easy route to get through?

A. It was not easy. Your Miller says it was hard to get through, but was the shortest route.

Q. If you had gone down the Greenbrier and down the New River, you would have been taking two sides of the triangle instead of one?

A. Yes, sir.

2082 Q. When you went by wagon?

A. Yes, sir.

Q. So it was easier to take the shorter trip by land?

A. I guess so.

Q. You spoke of the route from Wytheville down to Ingle's Ferry and across there and went over to Blacksburg. What was that road?

A. You mean in connection with east and west travel, or north and south?

Q. Both?

A. East and west was by Pepper's Ferry and Ingle's Ferry and you swung around to Salem or Buchanan. This North road was on the West side and went through Giles county by Pearisburg.

Q. That road started from Wytheville, did it?

A. Not necessarily. There would be other roads in the system. They called the East and west road the great road. Any road would lead off and one road led from Pepper's Ferry.

Q. That road was back from the river?

A. The one over the road to Back Creek.

Q. How far back?

A. I would say five miles from Cloyd's plantation, where he crossed the mountain Belspring.

Q. And it never gets nearer than about five miles from the river?

A. It gradually comes to the river.

Q. In between that road and the river, there was a great deal of settlement, was there?

A. No, sir; it is pretty rough in there.

Q. There was Dunkert's Bottom?

A. This was up the river from there.

Q. Wytheville is how far from New River?

A. From the Lead Mines?

Q. No, sir.

A. That is the closest place; it is about eight miles across there.

Q. It is about that distance from the river on this road?

A. No. The road from Wytheville towards Newbern, would practically follow the river. It gets to the bend at Rad-

2083 ford—Dunkert's Bottom—and the river swings back. That is the point I thought you wanted the distance, where the road turns off coming up to Wytheville.

Q. How far is that road back from the New River as it comes down?

A. From Wytheville.

Q. Yes.

A. The distances differ; eight or nine miles.

Q. My question may not be clear. Between that road and what is known as New River, there was quite a big settlement?

A. Settlements along the river; yes, sir. That is above the creek.

Q. Those people along the river could have used the river for boats, if they saw fit, could they not?

A. Yes, sir.

Q. This Lead Mine has been running without closing down since 1744, has it not?

A. No, sir; 1750.

Q. It has never closed down?

A. It has been in continuous operation so far as minerals are concerned.

Q. It has been a tremendous producer?

A. Yes, sir.

Q. And it is a very large plant today, isn't it?

A. Yes, sir.

Q. And it is operating today?

A. Yes, sir.

Q. And so far as is known they have not run out of sight of the ore vein?

A. No. They say the mineral extends down.

Q. They have what they call a lode deposit—an enormous deposit?

A. They make zinc now, instead of lead; they make zinc oxide.

Q. Mr. Kegley, have you made any study of the historical papers in the Virginia State Library?

A. Yes, sir.

Q. Relating to New River?

A. Yes, sir.

2084 Q. Have you made a very thorough study?

A. Yes, sir; generally of southwest Virginia.

Q. And it has been extensive?

A. Yes; and New River was a good part of it.

Q. I believe you said you were familiar with the report of Chief Justice Marshall?

A. Yes, sir.

Q. Did you ever read the report?

A. Yes, sir.

Q. Did you read this particular part of the report in Government Exhibit 189, page 22:

"The boat which conveyed your commissioners, passed from the mouth of Greenbrier, to the place where their expedition terminated, without being taken out of the water, except at the Great Falls of New River, and at the Great Falls of the Kanawaha. It was navigated in the usual way through all the other difficult places which abound in New River, except two—both below Bowyer's Ferry. Through these it was conducted by ropes.

"The boat was not laden, nor was it empty. In addition to the number of hands usually employed in navigation, it carried between two and three thousand weight. The greater part of this burthen was taken out in the most difficult places; but in many of considerable magnitude, it remained in the boat. Where the vessel was guided by ropes, the necessity of resorting to this expedient was occasioned solely by the intervention of rocks, which can be removed.

"It is also worthy of notice, that this voyage was performed by boatsmen, who, having never before seen the river, were reduced to the necessity of selecting their way at the moment, without the aid of previous information." Now, in your examination in chief, you did not make any comment with regard to what was in this report, did you?

A. No.

Q. Wasn't this an interesting fact with respect to New River?

A. Yes, sir.

2085 Q. Were you, in this examination or study, simply considering the question of roads and not the river?

A. No. It was the transportation facilities in use.

Q. Then, if you were, why didn't you call attention to that?

A. That was not in use. That was a special experimental test. I would not consider that a way of travel or traffic.

Q. Yes; but it was not only a trip to make an investigation, but it was to make a solemn report to the Virginia Legislature, wasn't it?

A. Yes, sir.

Q. You spoke of the Salley trip?

A. Yes.

Q. Don't you think that this was a more important trip than the Salley trip?

A. It was, perhaps, more important.

Q. Then, why didn't you mention it?

A. I did mention it. I didn't go into detail on it to decide it.

Q. Do you know the men that made this report—that is, their history or their record?

A. Yes; some of them.

Q. James Breckenridge?

A. Yes.

Q. Wasn't he an outstanding character?

A. Yes; so considered.

Q. He was so considered?

A. Yes.

Q. And William Lewis?

A. William Lewis was a good citizen. They were all prominent men.

Q. And James McDowell?

A. Yes.

Q. And William Caruthers?

A. I don't know much about William Caruthers, but it is a good name.

Q. And Andrew Alexander?

A. Yes, sir.

2086 Q. Do you know whether or not there was a map attached to the report of John Marshall?

A. There was.

Q. Have you ever seen that map?

A. I have seen a print of it.

Q. Where did you see that print?

A. In the State Library.

Q. What time did you see that print?

A. I have seen it this summer. I saw that print in connection with a study of Lynchburg, for an article on "Old Lynchburg since the Centennial Celebration."

Q. As a matter of fact, isn't there only the original map in the Archives at Richmond?

A. No, they had some prints. Mr. Hall said that the Board considered them important enough to have prints made.

Q. Is this Exhibit 189-A the print you refer to?

A. It looks like it. I think so.

Q. Are you able to read that writing in the lower right-hand corner?

Have me to read it:

"Although the great falls of New River are 23 feet in one place—the difficulty of making this part of the river navigable is not so great—by pursuing Richmonds Mill run the gradual fall is not more than 1½ inches to the rod—boats can descend this falls with great safety if the quantify of water is sufficient—and the water may be increased or diminished at pleasure by a low dam and gate of the falls; injury by flood can be avoided by a dam little more

than 100 feet in length & 10 feet high—it is said the river is so wide above the falls it never raises that height—a path way can be made on the margin of the canal, the boatmen can tow a boat up this fall with small loads & if they are heavy laden a horse can be used here with great ease and safety—or if preferred the place is well suited for making locks."

Did you read that particular section on that map?

A. I read practically the same thing, I think.

2087 Q. But you did not consider that when you considered the possibilities of highways in the State of Virginia, did you?

A. I was speaking of the highways in use.

Q. And you did not consider that they could be a highway in use?

A. It could be. It is a possibility of taking care of the report and the opinion for it.

Q. What was the date of the Jefferson notes?

A. 1780.

Q. And this was much later, was it not—the report of Marshall?

A. Yes, sir.

Q. And wouldn't you consider the report of Marshall much more valuable than the notes of Jefferson?

A. In the description of the river, do you mean?

Q. Yes.

A. Well, I don't know that I would. I was specially interested in Jefferson's notes, because it was a description of the lead mines.

Q. Do you consider Jefferson's notes as accurate as the John Marshall Report and the map?

A. The description of the lead mines I guess is accurate.

Q. It is nothing like in as great detail with respect to the river, is it?

A. No.

Q. That is, the John Marshall Report is in much greater detail, is it not?

A. Yes.

Q. And the Jefferson report was not made for any public body, was it?

A. It was made for dissemination of information.

Q. The Marshall report was made on a legislative request, was it not?

A. Yes.

Q. Now, I call your attention to plaintiff's Exhibit No. 32, being the Moore & Briggs report of 1819, which is already in evidence, and which is a report of the Board of Public Works to the General Assembly of the State of Virginia. You have read that report?

A. Yes.

Q. Have you read it with care?

A. Yes.

2088 Q. Do you recall this particular passage on page 13:

"The examination, levelling and survey of which, from the mouth of Greenbrier, up to the mouth of Sinking Creek, was commenced on the 5th of the seventh month 1819.

"This is truly a noble river. Notwithstanding it was presented to us as being remarkably low, yet it afforded a superabundance of water for every purpose of internal navigation. The fall in this part of the river, considering the mountainous country it passes through, is comparatively moderate. The principal falls are, the Bull Falls, McDaniel's, Anderson's, Wylies, Neilley's, and Peter's mountain falls: None of which has ever been improved in the least degree; yet we ascended them all with our boat; though, in two or three instances, with considerable difficulty, after taking out our baggage, stores, &c. The breadth of the river from 2 to 300 yards, and the length of this section 55 miles 58 perches.

"The fall and description of each mile, and the estimates of expense for effectuating a good sluice navigation of 2 feet, at all times, are a follows:" Then it sets that forth in detail. Did you take this into consideration when you were considering the possibility of the highways in the State of Virginia?

Mr. JACKSON. Objected to. The witness has not testified that he considered the possibility of highways.

A. In connection with that, I did not say anything about the surveys of these roads. At the same time they made the survey of the river, they made a survey of two roads.

Q. Why did you refer to the upsetting of the canoes in the Lewis report?

A. Do you mean in Point Pleasant?

Q. Yes.

A. It was done simply to show that they were using the water. I had no special point in the fact that they upset.

Q. Was that any more of a historical expedition, or an expedition worthy of your note, than the one by Moore & Briggs?

A. Yes. That is one of the most interesting occurrences in American history, that Point Pleasant expedition, resulting in the defeat of the Indians.

2089 Q. You spoke of two expeditions of Lewis?

A. Yes.

Q. One, you said, started from Dunkards Bottom?

A. Yes.

Q. What was the rendezvous of Lewis in that particular expedition? Who was he trying to meet?

A. The rendezvous was Fort Frederick. They were working west.

Q. Where was Fort Frederick?

A. At Dunkards Bottom.

Q. Wasn't there an expedition that went to Lewisburg?

A. That was a later expedition.

Q. How many people were in this first expedition?

A. Supposed to be a thousand, but not so many—probably six or seven hundred.

Q. They had horses?

A. Yes.

Q. Did you ever hear, back in history, of their shipping horses on the boats on the river, that they had at that time?

A. No.

Q. So, they had to go on land, didn't they, if they were going to take their horses?

A. They would not have had to take the horses if they had gone on boat.

Q. You would have to use horses in pursuing Indians, wouldn't you?

A. No.

Q. They did take the horses?

A. Yes; and they had provisions and wagons. They brought provisions there in wagons.

Q. Didn't some of the soldiers have horses, too, to use?

A. Yes.

Q. And didn't they have a great many horses?

A. I don't know how many horses, but they had horses.

Q. Did you ever hear of an expedition going down the Mississippi, by the French, or any expedition by British, in the
2090 northern waters, where they had horses and soldiers going on boats down the river?

A. I don't know that I have.

Q. You are sure you have not?

A. I do not recall an incident of that kind.

Q. This second expedition you speak of, where was it?

A. It was aiming at the Ohio—along the Ohio.

Q. Where did it start from?

A. It started from different places—different counties. Companies were made up in these counties.

Q. Where were they to meet?

A. The western division out here through the Holston Valley, and the New River volunteers were to meet at William Thompson's.

Q. Then where were they to go?

A. To proceed down the river towards the Ohio to meet Lord Dunmore.

Q. Where would they meet him?

A. They didn't know. Dunmore had proceeded north.

Q. As a matter of fact, he came from the north, didn't he?

A. Yes.

Q. Isn't it a historical fact that they were to meet at Lewisburg?

A. I don't know that.

Q. And didn't they meet at Lewisburg?

A. The Botetourt troops and Augusta troops met at Lewisburg.

Q. And they all had to cross the river, didn't they, and go up towards Lewisburg to meet Lord Dunmore?

A. Yes; that was Camp Union. It was a get-together at Camp Union. It was the natural way to travel.

Q. They could not get there by going down the river?

A. Not to Camp Union, but they could have come down the Ohio.

Q. I am asking you if it is not a fact that they did meet at Lewisburg?

A. Botetourt addressed the troops, and the camp at Lewisburg was called Camp Union.

Q. I am asking about Lewis' troops: Didn't they cross the river and go to Lewisburg?

A. Lewis' troops were never on the west side of the river. They were from here and from Botetourt and Bedford.

2091 Q. So that expedition was on the east side of the river, wasn't it?

A. Except the western counties. Christian's men were on the west side.

Q. Let us see if we can get this straight.

A. William Christian had the men from Holston and Clinch and the upper New River.

Q. You get beyond my depth when you begin to speak of Holston.

A. That is in Tennessee.

Q. That is in Tennessee?

A. The head is in Virginia, in the Counties of Smith and Washington.

Q. About where is Lewisburg?

A. It is down here [referring to the map].

Q. Now, take the Lewis troops; where did they start from?

A. They started from here and Fincastle and Botetourt and Bedford.

Q. You mean Roanoke?

A. Yes.

Q. Roanoke is over 40 or 50 miles from New River, to the right, isn't it?

A. Not quite.

Q. So there would not have been any point in their going down New River?

A. No, sir.

Q. So they went practically straight north to Lewisburg?

A. They went like this [pointing on the map].

Q. When they got to Lewisburg, there would not have been any point in coming to New River?

A. They went down the Gauley River.

Q. So what they did was to go down the Gauley River?

A. Yes, sir.

Q. Then they came to Kelley's Creek?

A. Yes, sir.

Q. Which, I suppose, is a short distance below Kanawha Falls?

A. Right there [indicating on map].

Q. There would not have been any point in their going on the river, would there?

A. Certainly not.

2092 Q. Now, then, I would like you to show the Court from this map where this main highway that you have spoken of was constructed, where it was located—that is, this highway that went from, I believe let us say Salem to Wytheville. Now, will you give us a line on that as to where that is?

A. Here is Reed Creek; Wytheville is not all the way up, but a little more than half the way up Reed Creek. Here is the direction [pointing at map]. Here is Radford, and it came towards Newbern, and this is Peak Creek. Ingles Ferry is a little above.

Q. So you are pointing in a direction on the map almost directly east, are you not, with respect to New River?

A. Northeast.

Q. When you get to New River, you cross what was known as Ingles Ferry?

A. Yes.

Q. Then, from there, where did you go?

A. To Salem.

Q. And Salem is directly east, is it not, from New River?

A. Yes.

Q. And about 30 miles, or something like that?

A. Yes.

Q. So there would not have been any point there in going up and down the river, would there?

A. No.

Q. Now, let us take the next one that you gave us.

A. Toms Creek Crossing and Peppers Ferry?

Q. That is right.

A. Just another crossing lower down. Blacksburg is here [indicating on map].

Q. Your pointer is pointing at a place directly east of the river and almost and a little north of where Peppers Ferry would be?

A. Yes. At that point the road came up the north fork of Roanoke.

2093 Q. That is from the east?

A. Yes; and another came from Catawba, this way [indicating]. They joined there, and one trail came up the point there, Lovers Leap. They struck the river at the mouth of Toms Creek.

Q. And Toms Creek is a short distance below Peppers Ferry?

A. Yes.

Q. Four or five miles distant?

A. Yes. That road divides at Price's Fork.

Q. So, when you approach on this road, you approach diagonally to the river?

A. Yes.

Q. In fact, every one of the roads or crossings which you have described as approaching from east to west were in a diagonal line?

A. That is all I was trying to do, was to show where the road crosses the river.

Q. There would not be any point in going up and down the river when you crossed the river?

A. No.

Q. You spoke of General Austin leaving this country and going down to Texas?

A. Yes.

Q. He was up, as I understand, at Austinville?

A. Yes; at the Lead Mines.

Q. Tell us in what direction he went?

A. He doesn't tell which road he went. He went down on this side by Christiansburg, or on this side, and got on this Newbern road, down Walker's Creek, and, in that case, he would have come into the Narrows and Glen Lyn. That road comes like this [indicating on map].

Q. In other words, that road is, in a sense, parallel to New River?

A. Yes. He would have gone down there and gone on to Gauley.

Q. How far is that road, approximately, from New River, that you spoke of?

A. I think the mouth of Neck Creek is here. What is this up here?

Q. Walker's Creek.

A. Here is Neck Creek and Back Creek. I would say
2094 the road at Cloyd's starts off at Dublin, and it is about five miles. Newbern is pretty close to the river.

Q. It comes to Newbern?

A. It then turns to the left.

Q. That is several miles back?

A. Yes, sir.

Q. Now where did that road you speak of cross New River, about the Narrows?

A. It crossed at Pearisburg and went over Peters Mountain or through the Narrows, and up Rich Creek.

Q. And then they crossed on the right hand side of the river going down?

A. But also a road that went down the left side, down to Glen Lyn, a road there yet.

Q. You don't know which side of the river they went?

A. No, I don't. I don't think that came out in the report. They left Captain Thompson and went down Rich Creek, and when they got there it looked like it was necessary to cross at Narrows. A letter in there from William Christian at Rich Creek, telling how they were getting along, said the mouth of Rich Creek, and then they went on up by Union.

By Mr. JACKSON:

Q. Is this the Austin trip?

A. I was talking about the road.

By Mr. THOMPSON:

Q. As I understand you say you don't know which side of the river Austin went?

A. No, sir.

Q. Did you make an investigation of the Statutes of the State of Virginia with respect to New River?

A. With respect to the general settlement of Southwest Virginia. I used Henning's Statutes pretty freely.

Q. Did that include the James River?

A. Sure.

Q. Did you make a thorough study of the history of James River?

A. Yes, sir; I began with the development of the settlers on James River.

2095 Q. Did you read the legislation by the Act of February 24, 1923, providing for a canal and a road, from upper navigation on the James to the upper navigation on the Kanawha, with power in the Commissioner to erect dams and reservoirs for feeders for the canal?

By Mr. JACKSON. May I interrupt a moment? If you want the witness to have sent in the Austin papers I will have to ask leave for him to telephone, because Mrs. Kegley is on the phone and reports she doesn't find them, and wants some further instruction if she is to locate them.

By the COURT. I think he could go to the phone.

By Mr. THOMPSON. I don't think we will need them now.

By Mr. JACKSON. That also applies to the Morses Universal Geography, 1882.

By Mr. THOMPSON. I don't think we need those.

A. That was the quotation, practically the same.

Q. Did you read the Act of March 8, 1824, providing for further surveys for the Canal Route?

A. I think so.

Q. And the Act of January 24, 1827, ordering surveys for a canal between the Roanoke and New River?

A. Yes, sir; I have.

Q. Did you read the Act of March 19, 1838, authorizing a bridge across New River on Price's turnpike to Cumberland Gap, reserving the right to improve the navigation of said river in any manner that was deemed advisable?

A. I don't recall that Price's turnpike—say that was 1838?

Q. Yes.

A. That is when that turnpike was authorized by Blacksburg.

Q. Did you read the Act of March 16, 1850, where the New River Manufacturing Company was incorporated?

A. I have read that.

Q. You read that.

A. Yes, sir.

Q. In Pulaski County?

A. Yes, sir.

Q. Did you read the Act of March 2, 1853, appropriating money and making loan to the James River and Kanawha Company, and requiring the company to define "the action to be taken by such company in the location of their water line from or near Covington or Clifton Forge to the Ohio River?"

A. Yes, sir.

Q. Going back to the Act of March 16, 1850, did you read Chapter 62 of the Code of 1849 making unlawful any dam obstructing
2096 navigation, and providing for the obtaining of authority of the Court of the County on condition that the dam be constructed in such manner as to improve navigation?

A. No; I didn't read that.

By Mr. JACKSON. I object because irrelevant and immaterial, and not proper cross-examination.

Q. Did you read the Act of March 5, 1856, Incorporating the New River Navigation Company "for opening and improving the navigation of New River from the Central Depot of the Virginia and Tennessee Railroad to the Wythe lead mines in the County of Wythe?"

A. I think I have.

Q. Did you read the Act of January 29, 1858, Incorporating the New River Navigation Company, which gave authority for the improvement of New River with power "to do whatever may be necessary to effect the improvement" and with "the privilege of renting, selling, or using any water power or other advantage."

By Mr. JACKSON. Objected to as irrelevant and immaterial, and not proper cross-examination.

By Mr. THOMPSON. Have you read the Act of January 15, 1802, reserving to the State from all patents issued by the State the ownership of the bed of this stream, and of others in the western part of the Commonwealth?

A. Yes, sir.

By Mr. JACKSON. I am objecting, but Mr. Thompson is characterizing statutes as to what they mean. If relevant, we assume they will be as they stand on the statute books—it is his characterization.

By Mr. THOMPSON. If counsel objects to that, we can send and get the books. We have them all here, I think.

By Mr. JACKSON. I merely say I don't concede the correctness of your characterizations.

By Mr. THOMPSON:

Q. Have you read the Act of December 18, 1861, Laws of the State of Virginia, 1861–62, page 72, appropriating $30,000 for adoption of such measures as might be necessary to remove the obstructions to the navigation of said stream by sluice, in such manner as would accomodate the transfer of military stores in bateaux from some point near the Central Depot on the Virginia and Tennessee railroad to the mouth of the Greenbrier River; have you read that?

A. Yes, sir. I might add that most of my later connection, that is my information or reading in regard to it, came in connection with a study of the transportation facilities for old Lynchburg in connection with an article I was asked to prepare for the Sesquicentennial celebration, travel on the canal and old stage routes, etc., that was my contact with those.

Q. In this history of the Middle New River Settlements by David Johnson, to which you referred, did you note in that document there is a reference to a Salling trip made down the river in 1730?

A. No; I don't recall it.

2097 Q. You don't recall it—have you got the book here?

A. I have the journal.

Q. The history of New River Settlements by David Johnson—also a trip made in 1742 by Salling, St. Clair, and Hinds?

A. No; I don't.

Q. Also an expedition in 1748 by Thomas Walker and Col. James Patton on New River?

By Mr. JACKSON. I object to the question. If you are going to ask the witness if that is shown in the book you had better show it to him in the book.

A. I am acquainted with Walker's; yes, sir.

Q. What was his trip?

A. A trip of exploration, two trips rather to the southwest.

Q. Were they on New River?

A. They crossed New River.

Q. Did he go down New River?

A. I don't know he did. He didn't say he did.

Q. All it does say is he crossed New River.

A. He was working to the southwest, went on to the Holston, Clinch, and to Kentucky.

Q. I believe you quoted from Jefferson's notes on the State of Virginia, published in 1787?

A. Yes, sir.

Q. Did you quote this part of that statement of his: "Yet it is the opinion that they may be laid open for useful navigation so as to reduce very much the portage between the Kanawha and James River?"

A. Yes; I did.

Q. Did you read that here?

A. Yes; I did.

Q. I believe you said you read the history of Summers?

A. Yes, sir.

Q. Do you consider it a fairly accurate history?

A. As far as I know. I have not had occasion to check on it.

Q. That main highway you spoke about that came from the east and crossed at Ingles Ferry, there was a bridge across the river, wasn't there?

2098 A. At one time.

Q. And that bridge was there before the Civil War?

A. Yes, sir.

Q. That bridge was destroyed during the Civil War?

A. Yes, sir.

Q. And subsequently a bridge was built a little farther down?

A. Been bridges farther down, and a bridge there now.

Q. So traffic going back and forth across that river went across the bridge, did it not?

A. It did while I was there I presume.

Q. Wasn't there a bridge built at Pepper's Ferry before the War?

A. I understand there was.

Q. Do you know what happened to it?

A. No.

Q. Washed away, wasn't it, by a flood?

A. No sign of a bridge there now.

Q. I believe you said you examined a number of deeds in various counties?

A. Quite a number of them.

Q. What counties did you examine deeds in?

A. My study began with [interrupted].

Q. Along New River let us say.

A. Of course you have to go back even to Orange, Augusta, Botetourt, Fincastle, Montgomery, and Wythe.

Q. What was the purpose of your investigation of those deeds?

A. To understand and locate the early settlements. I made a specialty of that, the land grants, people to whom grants were made, and the location of the roads; that has been my interest, the most careful part of the work. I began with the settlement of Borden's tract, that is the upper part of Rockbridge County, a little this side of Lexington.

Q. That was too far away from the river.

A. That was my beginning of investigation of land grants, and I worked it from there west practically from Lexington, west to Bristol, the early part I have a great deal of that mapped out, the actual land, the whole neighborhood.

By Mr. THOMPSON. We rest so far as the cross examination is concerned, but we would like the opportunity to examine these books, and if we find something we think important, to have the right to recall this witness for further cross examination.

By the COURT. What books?

By Mr. THOMPSON. The books from which he has quoted.

By Mr. JACKSON. The books are here available, and we would have the other two only counsel said they didn't want them.

NOTE.—Whereupon the following books were handed to counsel for the Government: First Explorations of the Trans-Allegheny Region—Alvord & Bidgood; The Virginia Magazine of History and Biography, April 1922; Notes of Virginia, by Thomas Jeffer-

son; Johnston's Indian Narrative; Virginia Historical Collection, Vol. III and IV, inc. Denwiddie Papers, Vol. I & II; Annals of Augusta County, By Waddel; Wisconsin Historical Publi-
2099 cation, Preston and Virginia papers. on redirect examination, testified as follows:

Q. Counsel for the Government asked you about a trip by Sallings or Sally in 1742, which he said was mentioned in Middle New River Settlement by Johnston. Is not that the Sallings trip about which you testified and quoted from his journal?

A. I think so.

Q. That was 1742, was it not?

A. Yes, sir.

Q. Counsel also asked you whether or not Sallings made a trip down New River in 1730, and I direct your attention to page 230 "Trans-Allegheny Pioneers" and ask if that refreshes your recollection as to whether Sallings made a trip in 1730, or merely crossed the river?

A. Sallings came from Germany in the year 1732, came to Virginia from Pennsylvania, near Balcony Falls, got his first land in 1740, and lived there as a reputable citizen and died there, and he is the only man that is placed on Fry and Jefferson's map.

By Mr. THOMPSON:

Q. That is not responsive to the question.

A. This 1730 can't be right, he was not in Virginia at that time.

Q. Then you are contradicting the book?

A. I am contradicting that date, 1730, that perhaps was picked up, I don't know, but Sallings wasn't in Virginia at that time.

Q. Are the other dates correct?

A. There might be others, but I happen to know that.

Q. Regardless of the error in the date, down the river or across it?

A. The same trip——

Q. I think the book says.

A. It says "John Sallings was captured on James River, crossed New River. He was probably the first white man to cross it."

By Mr. JACKSON:

Q. You were asked about a trip by Walker about 1758.

A. Thomas Walker and party crossed New River.

Q. Was that merely across or down New River?

A. His destination was Holston and Clinch. He didn't talk about going down New River.

2100 Q. Do you remember if he traveled by horse?

A. By horse.

Q. Do you remember anything in the historical accounts about him swimming New River?

A He jumped his horse in New River and didn't look for the ford—said he jumped the horse into the river and swam across.

Q. In your cross-examination something was said about the expedition of 1774, having horses and hence not being able to travel by water. Did the expedition of 1774 travel by water after it reached the Elk River on the Kanawha?

A. Apparently it did, in part at least.

Q. Some discussion about where these various units or companies or troops started from on that expedition, and you said the Western Division was at the Cloyd plantation. How far was that from New River?

A. I presume about five miles.

Q. Can you point out on the map about where it was on New River? How high above the river?

A. Above Eggleston and Little Neck Creek, comes in about here [indicating on map], they both drain rich valleys there, very early settlers there, and this Horse Shoe Bottom was a very fine tract of land, and another up here on Neck Creek, two brothers settled at these places, and Col. Cloyd lived on Back Creek, and the very earliest maps we have shown roads leading from there, crossing Pepper's Ferry, Ingles' Ferry, traveling in that direction. The map of 1820, the Woods map, made by the English surveyor, with a view of making a state map of the counties, the first state map made, shows that distinctly, these cross roads from Ingles Ferry to Col. Cloyd's, they formed a funnel effect for travelers starting north in case they wanted to go down the river.

By Mr. THOMPSON:

Q. That was about five miles back?

A. I think it was.

By Mr. JACKSON:

Q. Mr. Kegley, you were asked about how close the road from Wytheville down New River ran to the river. Can you tell me how close the road is to the river at Draper?

2101 A. Newburn was pretty close to the river and Draper was close.

Q. How far would you say?

A. Well, the river bends at Delton, but I don't think it is more than two or three miles.

Q. How close to Mac Adams?

A. Unless there is a bend, I would think it is further than that. I never examined that particular road.

Q. Mr. Kegley, on cross examination counsel developed that the history which you were writing and which you said was now in the

hands of the printers, was being published as a result, or at least it was accompanied by a subscription list for the book. Will you state whether or not the subscribers to this book or for this history, are among some of the colleges and universities of this country?

A. In that respect, the Southwestern Historical Society issued the prospectus giving an outline of it.

Q. All I want you to tell me is whether any of the subscribers to the history are universities and colleges?

A. They are, many of them. I think Mr. Turner told me he had 75.

Q. Can you name some of them?

A. From Universities in the north, east, south, and west.

Q. Name a few?

A. Boston and New York, Virginia and Kentucky—there are quite a number of subscribers from Kentucky, from Historians. The Filson Club, the most exclusive historical association in the Mississippi Valley, and some in Illinois, but I cannot be absolutely accurate about that now.

Q. Any in Michigan and Wisconsin?

A. Yes, sir; the Historical Library in Detroit, the University of Wisconsin, and the Wisconsin people have been mighty good to me in this matter, they have gone to a lot of trouble to photostat things and send me what I want. I have John Buchanan's journal, describing a trip out here to take possession of this country and make land entries, etc. Practically all of the original papers that we have, have come in one way or another.

2102 The witness on re-cross examination, testified as follows:

Q. Has any one of these colleges or universities seen your history?

A. They only have a prospectus.

Q. You spoke about Boston. What institution in Boston were you referring to?

A. The Library.

Q. Do you mean the library or University. I thought counsel asked you about Colleges and Universities.

By Mr. THOMPSON:

Q. Now in New York, what University or college?

A. I cannot be as positive about those subscriptions as I would like to be because I have only incidentally seen them.

Q. And all they have seen is the prospectus?

A. Yes, sir.

Q. You spoke about the Walker expedition. And you gave a description, as I understood it, in your cross-examination of probably a thousand men that were in the expedition.

A. The Walker expedition?

Q. Or was it the Lewis expedition? Counsel asked you when you got down to the place on Kanawha River, at Kelly's Creek, and I want to ask you if it is not a fact that the party that went down the Ohio was a very small part of the expedition?

A. Yes, sir; it was proportionately a small part of the number I presume, but there is no way to tell exactly how many took to the water. They were floating provisions there, and the main thing, I think, was to handle that.

Q. Now you were speaking of this expedition of Salley, and you referred to the history of the Middle New River settlements, by Johnston, as a very authoritative document.

A. Yes, sir.

Q. Would you mind reading the last paragraph on page 8 into the record?

A. "So far as known between the date of the discovery of this River by Col. Woods and Captain Henry Batte in 1666, Thomas Batte and party in 1671, John Salling, who was captured by the Indians, and carried over the river to the west thereof in
2103 1730, Salley, Howard, and St. Clair in 1742, Dr. Thomas Walker, and his party, in 1748–50, are the only white men that had seen or crossed New River, or penetrated this vast wilderness country prior to 1748, unless it were the three men whose names are hereinafter mentioned.

Do you want any comment on that?

Q. No.

A. That 1730 is presumably taken from that other book. Salling was not in Virginia at that time.

2104 E. C. GANNAWAY, on Direct Examination testified as follows:

I am 70 years old, live at Draper and was born in Speedwell, Wythe County. I lived there 14 years. I then moved to Delton, in Pulaski County, that was in the year 1880. I lived in Delton until 1886. I was at Delton constantly during that time, practically all the time. I was at school part of the time, in 1882 and 1883. I went to school at Trinity College, at Durham, N. C.

I knew Reese Tipton well. Mr. Tipton was not a relative of mine. He lived at the Boom Furnace, or Reed Island Iron Company. That is on Reed Island, but it was in the vicinity of Delton.

I observed some boating on New River when I lived at Delton. In 1881 there was some boating on New River. I don't think it lasted more than 8 or 9 months. I am positive. They were boating pig iron. I can remember two boatmen that were engaged in that work, who afterwards worked for my father. Clave Lawson, a white man and John Thomas Bland, a negro. The iron they were boating was loaded at Allisonia, at the mouth

of Reed Island, or two Reed Islands, where they ran together there. I only saw five boats. I remember five different boats. I don't know whether there was any more than that or not.

Prior to the time the iron was boated on the river, it was hauled away from Reed Island Furnace by mule teams, to Dublin and Pulaski. The teams going to Dublin came by my house. They did not come by my house going to Pulaski. After the boating ceased, they put the teams back on again, the mule teams. The iron was hauled to both Pulaski and Dublin. That was prior to the building of the railroad or the putting in operation of the railroad to Foster Falls. The railroad did not go to Foster Falls until 1886. That railroad is called the North Carolina Extension, but at that time it was the Cripple Creek Railroad and it belongs to the Norfolk and Western.

I left Delton in October 1886, and went to Draper. No por-
tions of that railroad, between Pulaski and Foster Falls
2105 were put in operation prior to opening up the entire rail-
road in 1886 to Foster Falls. They didn't haul any freight. They ran work-trains and things like that, but no freight was hauled.

I never went to the Macks Creek Furnace or the Radford Furnace when it was in operation. I don't know anything about that at all.

I do not remember any other boatmen that were on those boats, except those two men, and the way I happened to know them was they worked for my father after those boats were discontinued. I probably knew John Knode, but I don't know anything about him working on the boats or anything of that kind. I think I knew him. I knew Campbell Beverley. He is living yet. I do not know whether he had anything to do with this boating. I don't think he did, I am not sure about that. I knew Bud Whitt. I don't know whether he had anything to do with boating, or not. He used to run a ferry below my place.

The witness on Cross Examination testified as follows:

I was 16 years old when I moved to Delton. I entered Trinity College when I was nearly 15 years old, but when I entered Trinity I was living at Speedwell. I attended Trinity College for three years, I entered in 1880, and was there through 1883, that is, during the school session but I was at home three or four months of the year. I went to Trinity in September and remained there, with the exception of my vacations, until the first of June. I was only on New River from June to September during those three years.

I would say Reed Island Furnace is about 18 or 20 miles up New River, from New River Depot. I lived about seven miles from the furnace. I lived about a quarter of a mile or something

like that from New River. The iron was loaded into the boats that went down to New River Depot, at the mouth of Reed Island and at Allisonia. I think they were loaded at both places. These loading places were about five miles from my home. I was not down at the loading place at all, where they
2106 loaded the iron. Of course, I would pass by there, and I saw iron piled up there, and they loaded it on the boats there. I did not work or have any business with the Reed Island Furnace. No member of my family has ever worked for or had any business connections with the furnace.

Q. And all you know about their operations is what you either observed from being in the locality or from what you have heard someone else say?

A. I saw the iron myself.

Q. You were not in a position to state from general observation very much about when those shipments were made, or how much was shipped?

A. No, sir.

I was not there when the Government's Channel improvements, from New River Depot up to Allisonia, and beyond, were done. I know what my father told me when the Channel was made there and that a certain amount of money was appropriated by the Government to do this work. I moved to Delton in 1880. As far as I know at that time all the Channel improvements that were ever made on New River by the Government, were completed. I never saw any of it. I never saw them working at the Channel at all. I am not able to tell when the Channel was completed.

All the pig iron which was shipped from Reed Island Furnace by boat, was shipped in the year 1881 or in the spring of 1882. I saw no boats after I came home from Trinity in June 1882. I know that the teams were put back in 1882 and there were not more keel bottom boats on the river. If I had been at home I would not have been in a position to see the boats every day. When I was at Trinity I would not be on the river once every nine months. The school held for nine months. I did not know what was going on on the river while I was at Trinity, that would include the same period from 1881, 1882 and 1883. There were not boats running during my vacation in 1883. Of my own knowledge these boats were transporting pig iron on New River, in the summer of 1881, that would be the positive time. During that period they dispensed with all hauling by
2107 teams. I don't think there was a team hauling into Dublin. There may have been some teams running into Pulaski. I am not sure whether practically all of the iron hauled by wagon from Reed Island Furnace went to Dublin, because if

anything, it was a little nearer to Pulaski. I think the hauling was pretty well divided. I know of no reasons why teams would have been hauling to Pulaski and not hauling to Dublin, except they started grading the railroad, and after the railroad started to grade, the roads to Dublin were in terrible condition, because they hauled all of the supplies for that road, but they did not start until 1883, I believe.

As far as I know, while boats were hauling to New River Depot, there was no transportation by wagons from Reed Island. I don't know what they did with the teams. The furnace company owned the bateaux or keel bottom boats. I don't remember seeing a team hauling iron while they were hauling by boat—not during that time. I did not see any teams doing anything else in connection with the furnace. They might have been hauling charcoal too. No, I don't believe they hauled any charcoal from my section. They got the charcoal, after the railroad was started, they loaded it at Draper. They loaded coal for a long time at Draper, that was in 1886.

There was no transportation of pig iron by the railway, on the Cripple Creek Division of the Norfolk and Western until after 1886. There was no transportation of any kind of freight until the train ran to Foster Falls, except for the benefit of the contractor and some work trains. I recall when they constructed the bridge over Reed Island Creek and the bridge at Hiawassa on the Cripple Creek Division. That was before they got to Foster Falls; it must have been 1884 or 1885. I was there at the bridge that crossed the river. I drove a team after I came from college. I hauled for Mills & Fairfax, the contractors. I think they were putting in the abutments at that time. I do not remember seeing them transport stone from Howards Quarry to the bridge. I paid no attention to any work except from the bridge down this way.

I know very little about transportation on New River by boat. Just what I told you is all I know. I do not know anything about logging operations and timber operations on New River, in that vicinity.

2108 The witness, on Redirect Examination, testified as follows:

Delton is a mile this side of the Hiawassa bridge, across the New River, that is, on the north side about a mile down the river from the bridge. It is one mile down the river from the bridge. I didn't live over a quarter of a mile from the river. My house was not in plain view of the river, there was a hill between my house and the river. Part of the hill belonged to my father and part of it to Mr. Nunn. My father also owned property down toward the river. Lawson and Bland worked for us dur-

ing the time they were grading the railroad, and that was in 1884, I guess. Prior to that time they had been boatmen.

I went home in the summer of 1882. I got out of college about the first to the fifth of June each year, and I came straight home after commencement. I would go back to school about the middle of September. I did not come home for Christmas at any time while I was down there. I saw no boating of iron on the river in the summer of 1882. I was at the river during my vacation. I spent a good deal of time at the river fishing and swimming, like a boy does in the summer time, I spent a large part of my time there. When I was home I worked on the farm, and did work for those contractors, some, in the meantime.

The witness, on Recross Examination, testified as follows:

The furnace was running in the summer of 1882, it ran practically all the time, except when they closed down for repairs. I did not keep in close touch with the situation around the furnace. All I know is that it was running. I never did see the plant at Macks Creek Furnace. I never was there, until that furnace was practically pulled down. I don't think the Boom furnace was larger than the Macks Creek Furnace. All of those furnaces were practically the same size.

2109 N. B. HARVEY, on Direct Examination, testified as follows:

I will be 72 years old the last day of this month. I was born in Montgomery County, at Meadow Creek. I lived there until I was 23 years old. From there I moved up near Christiansburg on the Fultz place, 6 miles above Christiansburg. I lived there about one year, and then moved to Radford. I lived at Radford about 2 years. I then moved to Crumps Bottom, and lived there 2 winters and one summer, about 18 months. When I left Crumps Botton I went back to Meadow Creek in Montgomery County and lived there 5 years. I moved to my present farm at Werno, in Pulaski County, in November or October 1909.

I knew Col. John Crockett. I became acquainted with him in Radford, I believe in 1893. He was in the real estate business and I rented his farm in West Virginia. I moved to his farm in Crumps Bottom, in Summers County, by wagons from Radford in October 1893. The farm is on New River. I rented his farm at Crumps Bottom that winter and the next summer and the next winter. Mr. Matthews was there when I moved to Crumps Bottom. He had it rented before I went there. Mr. Matthews moved away from there by wagon to a farm in Giles County. I helped him move. When I moved from Crumps Bottom back to Meadow Creek, I moved by wagons.

While I was living at Crumps Bottom I now and then observed boating on New River. I saw different kinds of boats on the river. Sometimes somebody would come along in a skiff, and somebody would come along in what you called a keel bottom—a great big boat—40 or 50 feet long. I didn't see in the boats, but looking at them, some of them were hauling potatoes, apples, or corn and things like that. I saw it now and then. When the river was up—had a tide, you would see them, and when it was down, you didn't see them. I had occasion to make use of boats some, not very much, while I was down there. I customarily went to the market to take my produce with a wagon and got the supplies home the same way; took down something and brought back what we wanted in the wagon.

2110 Q. Did you ever make use of the boats?

A. Yes, sir; sometimes.

Q. Do you remember whose boat you used?

A. I don't remember who the boat belonged to, but I used to make arrangements with Mr. Meadows at the Salt Works.

Q. What did Mr. Meadows do there at the Salt Works?

A. He run a grocery store.

Q. Was that the same store that Mr. Peters ran?

A. If Mr. Peters ran it, I don't know anything about it.

Q. It was the same store at the place there?

A. Since you mentioned the name Peters, I think he owned the boat kept there.

Q. You made arrangements with Mr. Meadows, did you?

A. Whenever I wanted anything took down, I would go to see him.

Q. Did he take things down which you would have to have taken on the boat?

A. When the river was so they could; yes, sir.

Q. Was that a condition in your agreement with him?

A. Yes, sir.

Q. What do you mean when you say "when the river was so that he could"?

A. When they had a tide.

Q. Did you ever engage him to haul anything for you and he failed because the river was not in condition to do so?

A. Yes, sir. I sold my lease and I had four or five thousand bushels of corn, and I went back in July and August and shelled the corn and I went to Hinton and sold it up there to be delivered at a certain time, and I went and saw this man about his boat and asked him about hauling it for me—And I asked him to haul it down there, and he said, "I will haul it if the river is so I can." I agreed to take the corn there at a certain time, and, when he didn't come, I took it in the wagon. I hitched up the mules and took it in the wagon.

Q. You made an engagement with him to haul the corn at a certain time and he did not appear?

A. The river was so he could not haul it and I took it with the mules.

I didn't see many different boats on the river—many different boats, going up and down the river by Crumps Bottom, while I was there. I think most of them was just one boat that I saw when the river was up—would go down and maybe come back. I judged that it was the boat I would rent from Mr. Meadows. It might have been a different boat, but I judged from the people and the way it looked, that it was the same boat.

The occasion for my moving away from Crumps Bottom, was that Col. Crockett's house burned down in Radford, and he wanted to come back to Crumps Bottom, and he came and asked me what would I take to leave, and I told him, and he gave it to me. The salt works that I talked about, was Mercers Salt Works at Lick Creek.

The witness, on Cross-Examination, testified as follows:

I will be 72 years old the last day of August. I am the brother of Lewis W. Harvey, who testified in this case for the Government. I was born at Meadow Creek, in Montgomery County. It is south of Radford. Meadow Creek does not run into New River, it runs into Little River about two miles from the mouth of Little River.

I lived in Montgomery County about 23 years, on what was known as Meadow Creek. I couldn't see New River from there. I was often on New River: I had two sisters, one on one side and one on the other. I stayed one winter with them there. They lived at Ingles Ferry. During those 23 years my brother Lewis was there with me, as boys we worked on the farm and played together. We made some trips together. I was not with my brother all the time and couldn't say that whatever he saw I would see, but I was with him a fair enough portion of the time.

After the 23 years I went to Fultz place, which is 5 or 6 miles west of Christiansburg. That is away off from New
2112 River, not far off, but farther than I was before. I lived there about two years. I then went to Radford and lived there 18 months or two years. I then left Radford and went back to the farm on Meadow Creek. I was then about 25 or 26 years old. I stayed there about 5 years. I then left that farm at Meadow Creek and went to Crumps Bottom, to another farm. I stayed at Crumps Bottom about 18 months. I had my own team to move, but I had to hire others to help me. I had 6 or 8 horses. I stayed 18 months at Crumps Bottom and then went back to Meadow Creek on the farm. I moved back that time

y own teams and didn't hire any others. After I came
om Crumps Bottom, I lived at Meadow Creek about 4
ars. I then moved to a place known as Dry Valley, in
mery County, between where I lived and Radford. It
ser to New River; it would not be more than one mile
t across. I couldn't see the river from there. I stayed
Valley for 13 years. I then moved to my present resi-
t Werno, in Pulaski County. I have lived at my present
ce for 27 years; I moved there in 1909.
e no relation or connection with the Appalachian Electric
Company. There is an attorney for the Appalachian Elec-
wer Co., who has been my attorney. He is Mr. Draper. I
nployed him in some law cases. He has been my attorney
an once. He has been my counsel ever since I have been up
for 27 years. He is still my counsel.
ved to Crumps Bottom—I don't know whether it was the
rt of November or the last part of October, but along there,
. I left there in the spring of 1895, in April. I was at
s Bottom all the summer of 1894 and part of the spring of
The farm is alongside of the river. I could see any boating
river there; when a boat passed up and down, if I was
, I could see it. I had a pretty bad road from Crumps Bot-
Hinton. It was 16 miles from Crumps Bottom to Hinton.
nd you used a wagon some and a boat some?
es, sir.
know you are trying to give me your best recollection:
ou undertake to say what proportion of the time you used
boat and what proportion of the time you used wagons?
A. Used wagons right much—most of the time.
Q. What times of the year did you use a boat?
henever I wanted it, if I could get it.
hen you could get it, you used it?
es, sir.
ou found the boat preferable, did you?
he boat would take three or 400 bushels of corn or wheat
you had a team, it could not take so much.
hat did the boat carry for you?
carried corn.
id it carry wheat?
o, sir; I raised wheat, but it was not any account. I could
it and so I ground it up and fed it to the hogs.
hat did you raise for the boat to carry?
orn.
that all?
hey carried one load of apples for me, once.

Q. And you say about 400 pounds in weight it would carry?
A. It was 400 bushels of corn, not pounds.
Q. What would the wagons carry?
A. It depends on whose wagons and horses it was.
Q. It depended on the size of the wagon?
A. I hauled 110 bushels one time.

In case of bad weather, you could haul on a wagon, if you had team enough; you could move anything you had on it. You had to put on more horses.

With a good tide, the boat could go from Crumps Bottom, selling my stuff, to Hinton, in four hours.

I saw boats going up and down the river. I didn't know whether it was the same boat or several boats. It was a long boat, 40 or 50 feet long. Some called them keel bottom boats. One of them had 15 men on it. Most of the men were sitting down, but coming back they were all working. I judged the material I saw on the boats to be potatoes and apples, depending on the season.

2114 Q. During the period that you lived on Crump's Bottom, you saw boats carrying produce?
A. At different times of the year.
Q. You mean in the spring, summer, fall, and winter?
A. Yes, sir.

When the boats came back they looked like they were empty to me, if anything was in them, it was so little I couldn't tell it.

I did not have a store at Crump's Bottom. The landing place that shipped my stuff, was right in the front of the house. The boats did not stop there generally, not unless you stopped them. The boats had no bugle or horn on them. I heard them blow a bugle, but I thought they were just playing; that was not a common thing. I had a contract with a man named Meadows, a white man, I forget his first name.

Q. And your contract with him was that—what was it?
A. I don't know. I just got him to take what I had. I don't know what the contract was.
Q. Tell what you remember about it?
A. I don't remember anything about it, only I asked him to take stuff for me, and if the river was so he could, he would carry it; if not, he could not do it.

It was a verbal contract. It was as good as any other contract. Mr. Meadows lived in the building where he had his store, at the Mercers Salt Works. Way back in war-times, salt was produced there, but not when I was there. The store was right on the bank of New River. He didn't have a boat, someone else had the boat, and he was sort of the in-between man. He would negotiate with me for the boat. I couldn't tell who had the boat. He, Mr. Meadows, was a sort of broker, and did not run the boat himself.

Q. Over how long a period did you have this agreement with him or contract, with Mr. Meadows, or whatever his name was, to handle your produce by boat?

2115 A. I just know when I had a load of something, I would ask him——.

Q. (Interrupting.) You do not understand the question. Over how long a time did that run, for the summer or for a year or what time?

A. Just for a day. If I had something to go to Hinton today, I would go to him about it.

Q. I understand that—you had a right to go to him. But did that agreement between you and him to haul this stuff continue while you were at Crump's Bottom, during all the time you were there, you could get the boat?

A. No, sir; not unless he wanted me to have it.

Q. Assuming that he wanted you to get it, you could get it?

A. They kept it for hire, yes, sir.

Q. Did anybody else hire the boat?

A. I don't know.

Q. Other people lived there, did they?

A. Yes, sir. I don't know about that.

Q. What did he haul for you?

A. The only thing he hauled for me was apples and corn.

Q. How many miles above Hinton was your farm?

A. Sixteen miles.

Q. He had to pass over Bull Falls, did he?

A. Yes, sir.

Q. And he did pass over Bull Falls?

A. Yes, sir.

I had a crop of corn in 1894, but he hauled it for me in 1895. I cribbed it up in the winter and hauled it in the spring. I don't think he hauled anything for me in 1894, maybe he hauled a load of apples. The whole farm which I had at Crumps Bottom had 1,600 acres, but it took in some mountains. I had the whole Bottom. A lot of people lived back in the mountains but they

2116 had nothing to ship. I had about 400 acres of bottom land and was the only one on the Bottom. My corn crop was about 200 acres. I reckon I made about 40 bushels to the acre, and I had 200 acres. I had a big crop.

I moved away in the spring of 1895, and never lived in Crumps Bottom again. I suppose Mr. Meadows was still there with his boat. While I was there, he used the same boat, I think. I cannot recall his changing boats. As far as I know he had the one boat when he made the 16 mile trip to Hinton. I think he used the same boat when he went down and back through Bull Falls, for that period of 18 months. I knew Squire Peters, I

forget where, I couldn't tell you where he lived. He might have owned a store above there, I don't know. I don't know that he had a fleet of boats on the river.

Q. During the 23 years that you lived on or near New River on the river, with your brother, Lewis, near your sister, who lived across the river above Radford and between Radford and the mouth of Little River, didn't you often see boats on New River coming and going down to Radford and back up the river?

A. No, sir.

Q. None at all?

A. Yes, sir; I saw them. But you said "often." I saw them now and then.

Q. What do you mean by now and then?

A. I was not there all the time.

Q. But you were on the river a good deal?

A. Yes, sir; off and on.

I expect I was on the river a little more than my brother, Lewis. I did n't see boats on New River, coming and going past the mouth of I ttle River to Radford and back above the mouth of Little River, carrying pig iron. I never saw a boat of iron on it in my life. I didn't see boats carrying grain for the mill. The mill used to belong to old General Wharton. I have never seen
2117 pig iron hauled to the wharf and unloaded at New River Depot.

The only boats I saw above Radford was when I ran a livery stable in Radford, nearly two years, and old Captain Moore would ship us corn and we would buy it from him and he would deliver it when he had a tide in the river. He would run it down to Radford by boat. He would haul it from his farm where they are building the dam now. He lived at Dunkerts Bottom, above the mouth of Little River, the other side. If you went across the mouth of Little River, across New River, and went back up-stream, it would be about one mile to Moore's Farm. It would take you past the present site of the Appalachian Company dam. I once was past the site of the Appalachian Company's proposed dam two or three days ago. I saw the coffer dam on the river. I might have seen boats tied up there, but I didn't notice them. There is so much stuff piled up there. Rock piles and every sort of thing. There was evidence of work being done. I have seen this man Moore haul his corn, from a point above the site of the Appalachian Dam on a boat down to Radford, when the river was up. He would haul it on a keel bottom boat, or bateau. These shipments went on all the time, whenever the river was up, if we wanted it, we would go up. Any boat that went to Moore place had to go by the proposed site of Appalachian Dam. The boat went over Ingles Falls, both up and down the river.

Q. If you were there, as you say, a little more than your brother, were not you in position to see as much of the boats and the navigation on that river as your brother Lewis?

A. No; because he rode alongside of the river up to his farm on the bank.

Q. He lived closer?

A. He didn't live closer, but he rode alongside the bank.

Q. Why did you say you saw the river more than he?

A. I lived on the river and was crossing backward and forward all the time traffic'ing and trading and fooling around like that.

2118 The witness, on Redirect Examination, testified as follows:

I don't know whether the Mr. Meadows at the salt works was Mr. Joe Meadows. I used to know him pretty well when I lived there, but it has been so long I have forgotten.

Captain Moore lived up there on the Mebane place, which is the lower end of Dunkards Bottom. I don't know whether he owned that boat. I was crossing back and forth around Ingles Falls every day or two, but I never lived there. The boat which hauled Captain Moore's corn was the only bateau I knew anything about. The others I didn't pay any attention to. I was not concerned in it, and did not pay any attention to it.

I had no standard contract with Mr. Meadow about hauling my stuff from Crumps Bottom. When I wanted something hauled, I would go to see him, to see whether he could do it, and what he would charge me for it.

The witness, on Recross Examination, testified as follows:

I have said I had no business with the others and therefore I didn't know about them. I don't know whether there were others.

2119 W. R. HUNDLEY, by deposition, on Direct Examination testified as follows:

I am 84½ years old. I was born in Roanoke County, Virginia, about 5 miles east of Salem. I moved from this residence to Montgomery County, on the Estridge farm. At the age of 6 I moved to Snowville, about 10 or 11 miles south of Radford, on Little River. Little River empties into New River about 4 or 5 miles, 4 anyway, from Radford. Snowville is 4 or 5 miles from the mouth of Little River, where it empties into New River. I lived at Snowville from that time until I was in my 21st year. I left Snowville and went to the Kanawha River, a little town about 17 miles above Charleston. I went from there to Elizabethton, Pennsylvania, and lived there in that town and sur-

roundings probably a year and a half. I returned to Virginia in 1876 and came to Snowville. Snowville was my home from that time until 1894, when I moved to East Radford. I have lived at East Radford ever since. I was away about a year and a half when I moved to Roanoke, but returned to Radford.

Mr. ABBOT. If your Honor please, that is as far as we care to read in the direct examination.

Mr. WILLIAMS. I ask then, your Honor, for the privilege of having the Government read from this point to the point Mr. Abbot desires to read again.

The COURT. Yes.

Mr. ABBOT. Of course, if your Honor please, that is subject to our exception?

The COURT. Yes.

The following portion of this deposition was introduced by the plaintiff:

It was something like 1912 when I went to Roanoke. I have lived in and around New River from the time I was 6 years old to the present time, except the time I was in Pennsylvania. I am not familiar with New River, not so familiar. I have not been on it. I have looked at it. I was on the railroad
2120 about 23 years, up and down the railroad, in sight of New River. My familiarity with New River consists of seeing it.

Q. What did you do with the railroad?

A. I was foreman, building bridges, stations, etc.

Q. Across New River?

A. No, sir; on the railroad, had nothing to do with the river at all.

Q. State whether or not along about 1877, 1878 and 1879, along in there, there were bateaux operating on New River.

Mr. ABBOT. We object to that question because it is leading.

A. I think about 1878 there were several bateaux built at a little town adjacent to Snowville, Graysontown. I think five or six bateaux were built at that point.

That is about 8 miles from Radford. I saw them building these bateaux. They were about 60 feet long, about 8 feet wide, and they would draw about 4 feet of water, I would think. They had a round keel bottom. I would say they would draw not more than 18 inches, when empty. I expect probably they were a year in building them. I don't know what would be their capacity in tons, just guessing at it, would say about 3 tons, something like that. I don't know how many of these bateaux were built. They were run from Graysontown on New River. I came down on one. We had a Sunday School picnic and a new bridge built across New River, and wanted to have our picnic at this bridge. The

bridge was between Radford and Snowville, across Little River, about 4 or 5 miles from Radford, and one of the boats was completed by the time we wanted to have our picnic and they agreed to take us down to the bridge on the bateau, and we were brought down from Graysontown in one of the new boats. I would guess there was about 50 in the boat, quite a number of children. It was a Sunday School picnic. I would say the trip was something like 10 miles. There is a considerable bend there from Little River to New River. I think Graysontown is something like 10 or 11 miles above the mouth of Little River where it flows into
2121 New River. The other bateaux were brought down Little River. Little River is a tributary of New River. The boat that took the Sunday School picnic went on down New River, and the picnic crowd was taken back in wagons and buggies to Snowville. From the mouth of Little River the boat went right around the bridge. We ate our dinner at the bridge. I don't know that I ever saw a bateau on New River at all.

Q. Where did they go?

A. They were used on New River, but I wasn't about the river, I was at home.

Mr. ABBOT. We object to his telling what he doesn't know of his own knowledge, and move his answer be stricken out.

I have seen several bateaux taken away from Graysontown and I rode away in one to the bridge on the picnic. The bridge is a quarter of a mile, something like that, from the mouth of the river. We didn't go on down the river at all. We got off our boat at the bridge and had our picnic and were taken from there back to Snowville in wagons and buggies.

Q. Did you know the bateaux were being built for use on New River?

A. That was the report.

Mr. ABBOT. We object, and move to strike the answer out.

Q. Do you know what traffic the bateau carried on New River, what kind of merchandise?

Mr. ABBOT. We object to that question. The witness stated he had never seen a bateau on New River.

A. I only heard it carried—in the first place, it undertook to carry the iron ore from Max Creek furnace from New River to the depot and carried some of the iron down there and seemed to be a failure, but that is only hearsay, I only heard they used it for that purpose.

Mr. ABBOT. We move to strike the answer out that part that is based on hearsay.

Q. Let's see how you heard this. How did you hear it?

A. Just general talk.

Q. You mean in the community?

A. Yes, sir.

Q. That the bateaux were carrying first iron and then farmer's produce?

A. That was the report.

Q. Up and down New River?

A. Yes, sir.

Mr. ABBOT. We object to the questions as leading, and to the answers because based on hearsay.

2122 The furnace where the iron was used was something like two miles or two and a half miles from New River at a point I would say opposite Dublin, on New River. Dublin is about 7 or 8 miles, about 8 miles up the river from Radford.

There are farms along New River above Radford. The farmers raised in those days pretty much of everything that was raised on a farm, corn, wheat, oats, cows, horses. There was no railroad from Snowville and vicinity and from the mouth of Little River at New River down to Radford in 1877, 1878 and 1879. The railroad at that time was the Norfolk and Western Railroad, Lynchburg to Bristol. It came through East Radford. That railroad was built I think in something like 1850 and 1851. From the time I knew, the railroad was at East Radford. The railroad crosses the river here at what we call New River. It crosses the river at the same point it used to cross it.

The bateaux I saw built at Graysontown, were built by a man named Adam Craft. These boats were built by hand labor. There were two saw mills near Snowville, one at Graysontown and one at Snowville. There was quite a bit of timber standing on the hills at that time, a little ways out, not right near the towns, but a mile or so out.

I knew a man named John Coffey. I do not know whether he worked on these boats. I hear he says he did. I didn't see him working on them.

(Defendant objected to the statement of the witness as being hearsay evidence and moved to strike it from the record.)

There was a report about the Government making a channel in New River. I did not see the work being done, but I saw the imprint of the channel after it was made, you could see that. The only one I could see was probably a quarter of a mile above the railroad bridge a little sluice and the riffle upstream. I do not know how far up the channel went. I would have to guess at the year it was built. I would say the channel was made in 1866 to 1870 between those days somewhere. I knew J. R. Lawrence. He worked on this work quite a little while, pretty much all the time they were dredging this river. I would guess the Government work was carried on for a year.

The iron ore was converted into iron at Macks Creek Furnace, that is about two or two and a half miles from New River, just east of New River, about I would say something like 20
2123 miles above Radford. I worked at the furnace myself for about six months, about the year 1869 or 1870, about that time. That was before the bateaux were built. I worked there when a young man, then I left this country and was away four or five years. They were making iron. I was there as a carpenter. We built a dwelling for the superintendent and did quite a bit of work around there. I saw the processes of the furnaces. The iron would come to the furnace in the form of crude ore. This ore was taken from the mines up New River, from the mouth of Macks Creek that ran down from the furnace. I don't remember any iron ore below that, I don't remember about that. While I was working there the ore was hauled from the river by teams. I don't know how they brought it down. I don't know whether it was brought down the river or hauled by teams from the mines. The mines were close to the river but many miles above Macks Creek. I don't know exactly how far. I don't suppose the Macks Creek Furnace operated after 1876. I left this country in 1872. The furnace itself is something like two or two and a half miles back from the river. No matter how the ore was brought there, it had to be hauled from the bank of the river to the furnace. I do not know where the iron was shipped to from the furnace.

(The following portion of this deposition was introduced by the defendant.)

The witness, on Cross Examination, testified as follows:

I started to work for the Norfolk and Western Railroad in 1899. I believe I took my foremanship. I was a foreman and took charge of my work in the year 1899, but I had worked for the railroad before that, I can't remember just off-hand when I did commence, but I commenced before that.

The railroad down New River was called the New River Railroad and subsequently called the New River Division of the Norfolk and Western. It was an independent branch at that time from New River to Pocahontas. I worked for the company at the time that road was built. We had a frame yard for the purpose of framing bridges for this New River
2124 road, and I worked on that. I was there at that point for about 20 or 21 months framing these bridges, and as we framed them, as the grade was completed and the bridges called for at certain points, we would ship them out by work trains, as the road was being built. All of the bridges for that railroad were framed in our yard at Belspring. I framed every chord from New River to Pocahontas, except the chord in two

bridges, one at Wilson's trestle and the other at Back Creek trestle. Wilson's trestle is gone now, but it was just as the road went over this hill going over to Belspring. The Wilson trestel was over a dry hollow. I don't know who framed the timbers for these two bridges. They were framed before I took my position there. Both of these trestles were in Pulaski County.

Belspring is about four miles due north from Radford, one-half a mile from the river I guess. The timber that was framed was received there by team. I do not know whether any was received by water. I think I would have known if it had been received by water. I was foreman over a gang of men that did the framing part on the bridges. I was there constantly during that time. All of the chords were shipped out on flat cars on the railroad. That includes all the bridges and trestles from New River to Pocahontas, with the exception of the two trestles I have mentioned.

There was quite a bit of timber sawed across the river from Belspring, hauled over by team, and the chords we framed came from some other point by train. I don't know where they came from.

The bateaux I saw being built at Graysontown was after the channel was made in the river by the Federal Government, and the trip I made down Little River was also after the channel was made.

While I was working as a carpenter at Mack's Creek, I saw them hauling the ore there by teams. I never saw any of it hauled on the water. It all came there by teams. It could not have come any other way. There may be a mine about 300 yards from the furnace now. There was none at the time I was there. I don't know what the mines up the river were called, they were just mines opened up by whoever owned the ore in the mountains. I couldn't tell
2125 you just where they were located. There were several different points. There was one or two shipping points right close to Allisonia. I don't know how far. Another little town above that, I forget the name of the town, several mines opened up not far from this place, I couldn't tell you just where they were. I did not see any ore taken out of mines up the river and hauled there at that time. All I know, is that I was working there on some buildings and the ore was hauled by wagon.

From 1876 to 1894 I was constantly along New River coming to work and going home. I was in sight of this river while I was working. Pretty much of the time I spent in Radford. I was observing the river all that time. I came down the river, four miles coming to my home, I came in sight of the river, probably half a mile from the river. During all that time I never saw a bateau on the river.

The following portion of this deposition was introduced by the plaintiff:

The witness, on Redirect Examination, testified as follows:

The time I worked at the Macks Creek Furnace was when I was quite a young man, long before I saw the bateaux built. Macks Creek comes into New River on the right hand side, coming down. The iron ore could have been hauled all the way from the mines by team, because there was a wagon road along the right side of the river. The mines were on the same side of the river. I don't know anything about the condition of the road. They generally used four-horse team.

We framed the bridges and trestles at Belspring. The timber was not very close to Belspring. The timber put into the trestles, and the braces made for the bridges was brought across the river, was sawed over in the hills across the river from Belspring and brought across there. It was probably brought across by ferry boats, I didn't see that done.

The following portion of the deposition was introduced by the defendant.

2126 The witness, on Recross Examination, testified as follows:

I suppose this road on the right bank of New River which I referred to is one of the oldest roads in this part of the country. It goes to the lead mines in Wythe County. I don't suppose the road has a name. There is what was known as the lead mine road, a road that runs north and south, coming from Lynchburg by Christiansburg, by Snowville, and through to Radford furnace, or close by, that is what was known in this country as the lead mine road, a public road for years and years. I don't know how far it went. It was a very old road.

The following portion of this deposition was introduced by the plaintiff:

The witness, on Redirect Examination, testified as follows:

At the time I worked there I had never been up this road above Macks Creek any distance. Everything that I have said about the road beyond Macks Creek on the road is hearsay, but from Snowville to Macks Creek I was well acquainted with it, because I walked over it every two weeks, going from my home. The general course of the road would follow New River all the way along here, ten miles out in the country, but not above Macks Creek. I don't know anything about it above Macks Creek.

2127 JOHN G. OSBORNE, on Direct Examination, testified as follows:

I am 84 years and 8 months old. I was born in the City of Philadelphia. I came down to the New River section in Janu-

ary, 1880, with the New River Railroad Company. That company had charge of building the road from New River to Glen Lyn. When I came down to this section I went directly to Pearisburg and lived there until July, 1881. I then moved my headquarters over to Eggleston Springs. I was at Eggleston Springs I think about a year during the construction of that division. Then I moved back to Pearisburg, where I lived until December 1883. I then went to Radford and have lived there ever since.

I came down to the railroad company to be with the engineering force. That not being ready I acted as auditor and paymaster until the work began. The work began in July, 1881. I was then division engineer and worked from Radford to Walker's Creek, about 20 miles, including the two terminals. About six miles of this division was on New River, it left the river at New River Station, and crossed over Schooler's Hill. It then came back to the river at Back Creek and then ran right along the river all the way to Walker's Creek.

That division of the railroad was constructed under contract. Mills and Rolland had the contract for the first 38 miles, and they also had the contract for laying track all the way. They gave this up and the railroad company took it over. They gave up the contract for laying the track after they had laid about 36 miles down near Glen Lyn.

My duty with reference to the contractors was to see that the work was being pushed and done properly. My duties required me to be out on a part of the work every day during the whole period.

The contractors had the main commissary at Eggleston Springs, on the opposite side of the river from the Springs. That commissary was supplied mainly by teams from New River. These teams were owned by the contractors and they were driven by a man named Robey. The contractors were supplied with their tools and materials by these teams.

2128 Clark Bridge Company, of Baltimore, built the bridges on that work, that is, they had the contract. They had a commissary at Belspring. It was their principal framing ground for the bridges. The bridges were of yellow pine and it came in and was taken out there to the framing ground.

I think the timbers for the first two bridges after they were framed were hauled by team from the framing yard. They were the bridges over Back Creek, and the bridge over Dry Branch, and the bridge over Walker's Creek, about 30 feet. These bridges were in Pulaski County and comparatively near New River.

The members for the other bridges were shipped by rail to the bridge sites after the track was laid. There were a good many

little trestles in there, the timber for which was gotten locally from the mills. The location was right close to the bridge site. All of that framing was done there. This timber was hauled by wagons.

After Mills and Rowland completed all of my division, that is, the grading and laying of the tracks, I moved my headquarters back to Pearisburg and took charge of the track laying, and the erection of stations and tanks, and so on. The company took the tracks over October 7, and I was with that until we got it finished to Pocahontas, March 10, 1883. When I took charge of the track laying October 7th, about 36 miles of track had been laid. That was down near Lurich. I had charge of laying the track from that point on to Pocahontas.

Mills and Rowland used a work-train for getting materials to the point where needed and supplying the men as the work progressed. They started laying the track about New River depot. The men engaged in doing this work for the contractors stayed at different points, mostly, I think, at the commissary at Eggleston and Belspring, and after the company took over the track they had camps that continued all the way to Pocahontas.

During the time of the construction of that road, I did not see any use made of the river for hauling material or supplies. Mr. Mills told me that Clark Bridge Company had used the boats for shipping some bridge iron down to the framing
2129 grounds at Belspring and that he was going to try shipping some of his stuff to the commissary at Eggleston. I don't know how long after that, about a week or ten days, he told me it had not been at all satisfactory, and he had stopped it.

I never saw anything transported on the river. I saw one of the bateaux at New River evidently loading, but I did not examine closely. After the completion of the road to Pocahontas, my duties were division engineer and trainmaster on that division. We were ballasting and getting the road surfaced up for operation. The railroad was put in operation in January, 1883, to Winona, now Pearisburg. I think it was extended to Long Falls, now called Ada. Ada is the first station this side of Bluefield. I think it was opened there the latter part of March, but I am not sure about that date, and it was operated to Pocahontas in May, 1883.

Q. Now, when you became—what was it? Division Engineer and trainmaster?

A. Yes, finishing the construction and ballasting and surfacing the road and erecting stations and tanks and that kind of thing, and then trainmaster in operating.

Q. Where were you located during that period of time?

A. I was located at Pearisburg until, as I said, December 1883, when I was transferred to Radford.

After I went to Radford, I was engaged over the whole line. I was around New River Depot and New River Bridge a good deal during that period. I was around that part of the railroad some most every day, I think. During that time I did not see any material of any kind being boated in and around New River Bridge.

Our railroad did do some construction work along New River in West Virginia. That was done in 1880—probably some in the latter part of 1879. I would go down there from month to month to pay off the hands. That was not being done under contract but by day work—and checking the commissary.

The Walton cut-off on the Norfolk & Western was started in 1899. I had charge of that work for Walton & Luck, the
2130 contractors. The stone for the abutments was shipped by rail from Falls Mills to where the Peppers Ferry road crosses the railroad, about two miles from Peppers Ferry. It was hauled then by team to Peppers Ferry and from there it was loaded on scows—flat scows—and ferried across the river, and down the river to the bridge site. The river between Peppers Ferry and the bridge site was one of these pools that exist in New River—a long stretch of the river.

I had something to do with the construction of the boats used in that work. A man by the name of Hodge was building the boats at New River. One of them was rigged up with a little stationary engine, a vertical boiler and paddle wheel. I was on that boat when it was floated down the river from Hodge's mill at New River Bridge to Pepper's Ferry. The condition of the river at that time I think was just a little full, but I am not sure about that. These boats were flat boats, flat bottom, just like the ordinary ferry boat. During the trip of this boat down the river we had several stoppages, and running ashore, and would have to lead it off.

After I went to Radford, in December 1883, I had charge of the Radford Yard. It extended from down near Plum Creek, on the east, to New River on the west. I remember Col. Crockett. He lived originally at Crumps Bottom, but moved to Radford, and lived on 8th Street. He lived there two or three years, I believe, and then his house burned. That must have been between 1893 and 1894, but I am not sure about that.

The witness on Cross Examination testified as follows:

I was born in 1851. I cannot say of my own knowledge that the main line of the Norfolk & Western from Bristol east had been constructed at that time. I don't think there was a railroad in that country at that time. I think the Virginia and Tennessee

road up at this end was finished about 1856. As far as I know, that was the first railroad in that country. It ran from somewhere over in Tennessee, about Bristol, and crossed New River at what is now Radford and then proceeded east on through Roanoke.

2131 I believe there was no railroad coming into that country until the time the C. & O. came up New River as far as Hinton and then bore up the Greenbrier eastward.

Until the New River Division of the Norfolk & Western was constructed, there was no railroad parallel to New River below Radford, as far down as Hinton. That distance by the river I think is 85 or 90 miles. I would not say that the New River Valley between Radford and Hinton was very well settled in 1870.

Prior to the time the New River Division was constructed, which was between 1881 and 1883, the only means of transportation present for the settlers was by wagon or by the river. The wagon roads in those days were very poor roads. I would imagine it would take somewhere from four to ten or twelve horses to transport any considerable load by wagon in bad weather. In very bad weather there were big ruts, and so forth.

The western terminus of the New River Division was at Pocahontas. Pocahontas is about fifteen miles northwest of Bluefield. The only portion of this division that paralleled New River was after it struck the river about Glen Lyn and proceeded south upstream to Radford. The railroad ran up the river from Glen Lyn to Back Creek. By railroad and across the hill Back Creek is about 6½ miles below Radford.

The timbers for the trestles for these small streams were practically available right on the spot, especially the big one at Back Creek. The trestle at Dry Branch was about a quarter of a mile from the river. If any of this timber used in either of these trestles had been transported on the river, it would have been necessary to transport it from the river back to the site of the trestle.

Q. Now, you spoke of the concern which constructed the bridges?

A. Clark Bridge Company.

Q. And what bridges did they construct?

A. They were supposed to construct all of them.

Q. All of them?

A. Yes, and a part of the trestle work, too.

Q. And it is your information that the Clark Bridge Company did use New River?

2132 A. I was told that.

Q. You told about it on your direct examination?

A. Yes.

Q. They used New River to transport their material from the railway station to the site of the bridge?

A. Yes; some bolts and castings for the bridges.

Q. In other words, some iron?

A. Iron, yes.

Q. And I believe you said that you discussed the situation with Mr. Mills?

A. Mr. Mills, the contractor.

Q. And he contemplated using the boats himself?

A. He said he would try it.

Q. And then, in about a week or ten days, he said that he had not?

A. He had tried it.

Q. It was a short time?

A. A week or ten days later.

Q. Do you know anything about the river, or did you know anything about the conditions on the river, from Hinton up to Glen Lyn at that time, in 1880, 1881, and 1882?

A. No; except what I saw when I went down to Crumps Bottom.

Q. When did you go down to Crumps Bottom?

A. In 1880.

Q. 1880?

A. Yes; I went down to pay off the force.

Q. You went down there one time?

A. Several times.

Q. I ask you if you do not know that it is a fact, Captain, that along about 1881 or 1882, while they were constructing the Norfolk & Western along at Glen Lyn, or just prior thereto, when you have told about some building in connection with the Norfolk & Western in West Virginia, that there were four
2133 or five keel bottom boats regularly plying between Hinton and just below Shumate Falls, carrying supplies for the Norfolk & Western?

A. No, sir; I do not.

Q. You don't know that?

A. No.

Q. You are not testifying that they were not, are you?

A. I don't know that they were not. Supplies for the Norfolk & Western?

Q. Yes, for the very concern for which you were working?

A. For the contractors?

Q. Whoever was building the railroad?

A. No; I don't know.

Q. I will ask you, after your suggestion, don't you know that there were four or five keel bottom boats, along about that time, hauling supplies from Hinton to a point in Virginia just below Shumate Falls, for the contractors who were grading for the Norfolk & Western?

A. No, sir; I do not.

Q. You don't know that?

A. No, sir.

Q. I had understood you to say that the Norfolk & Western constructed its line and contracted for the grading; am I right in that?

A. Yes, it was all under contract.

The construction of the cut-off at Walton or Peppers began in 1889. At that time there was transportation of material in scows on the river. There was a little boat they had rigged up with stationary engine and paddles. This steamboat was about, I suppose, 30 feet long and 10 or 15 feet wide. I did not know Mr. T. W. Coleman. I am quite sure that they did not haul 25 or 30 tons on that boat. 30 tons would have put that boat on the bottom. The boat was going through from Peppers Ferry to the side of the bridge in one of the pools on New River. This pool would be anywhere from six inches to ten feet deep. There was one place which was right shallow. I don't remember
2134 how shallow, or where, but they had to pull through carefully. I don't know whether there was some work done in the channel to permit the steamboat to take its tonnage through that particular place. The depth of this pool varied. I expect in some places in the channel it was 8 or 10 feet deep. I don't know how many of these pools there are on New River. There are some, but they don't hold the same depth all the way through. There are some shoals and rapids.

I moved to my headquarters to Radford in December, 1883, and have been there ever since. It was then Central City or Central Depot. I had charge of the yards there until 1897. I only know in a general way about the traffic incoming and going out from Radford prior to 1883, but I am familiar with it after that time.

I know when the Cripple Creek branch was completed as far as Ivanhoe. It was just about completed when I was transferred to the Western Division, had just opened it before I took charge and the construction was going on beyond that. The first regular traffic began in 1886 to Foster Falls, but not to Ivanhoe until sometime in 1888, I think, 1887 or 1888. I don't remember just when it was opened to Foster Falls first, I wasn't over on that end of it. It was opened to there first. Hiawassa, with respect to Foster Falls, is north of Foster Falls, between there and

Pulaski, it is just after you go down the hill from Pulaski across New River. The grading was done and the road completed from Pulaski south and went through Hiawassa first. I didn't say there was traffic by Foster Falls before there was by Hiawassa. I said it was opened to Foster Falls—the first time I think—1886.

I have a little block of stock in the Appalachian Electric Power Company.

The witness on Redirect Examination testified as follows:

I am a voter and taxpayer of the City of Radford and a paying client of the Federal Government. The railroad company had jurisdiction over all of the construction of the New River Division of the Norfolk & Western and let the contract. But the Norfolk & Western or the New River Railroad Company was not buying any supplies or furnishing any supplies or itself
2135 using any supplies down there until I had charge of laying the track. I did not have charge of getting the material and supplies for the railroad when I began laying the track. All of those supplies were ordered by the Chief Engineer and came in on the road, the rails and splices and switches and such things, and the cross ties had all been made and piled up along the road. Those supplies came in over the railroad from New River Depot.

The witness on Recross Examination testified as follows:

With reference to the transportation by boat at Peppers Ferry, the boat was loaded at the ferry and then went across the river and about three-quarters of a mile down.

ROBERT C. MCWANE, on Direct Examination testified as follows:

I am 63 years of age, was born in 1873. I am a mechanical engineer. I do not own any common or preferred stock, or debentures of the Appalachian Electric Power Company. I am not employed by the Appalachian Electric Power Company.

Q. Does your wife or any of your children, your grandchildren, brothers, sisters, aunts, uncles, nephews, nieces, of any of your relatives, so far as you know, own any securities of the Appalachian Electric Power Company, American Gas and Electric Company; or are any of them employed by either company, or any of them, so far as you know, have any financial interest in either company, or have any promise of any financial interest in either company?

A. Not that I know of.

I was born at Wytheville, Virginia. I lived there until I was fifteen. I went from Wytheville to College at Milligan, Tennessee, where I spent two years, and the following two at Bethany, West Virginia. In the meantime, my family had moved to Bluefield, and I joined them there. I remained in Bluefield about

two years. I then went to Bristol, Tennessee, as superintendent of the Bristol Foundry and Machine Company,
2136 owned by Major A. D. Reynolds. I then went to New York, with a pipe brokerage firm, M. J. Drummond Company. I remained in New York nearly three years, until 1899. In April or May, 1899, I went to Radford as Resident Manager of the Radford Pipe Works, the General Manager of which was my brother H. E. McWane, of Lynchburg, Virginia. I remained at Radford until September, 1901.

I have never seen a bateau on New River. I am the same Mr. McWane that owned a gasoline driven boat mentioned by witnesses.

Q. Will you state how you happened to acquire that boat?

A. During my residence in Radford, I became quite intimately acquainted with a first cousin, Walter Dudley, who was born at New River Depot, and who had lived on the river all his life, and he told me about the money that had been spent on the river by the Government in dredging channels above Radford, and suggested that we build a power boat and enter the river transportation business, attempt to develop some river transportation.

At that time I was employed by the Radford Pipe Works, but soon afterwards the Pipe Works closed on account of financial difficulties of the Virginia Iron, Coal and Coke Company, the owners, got into financial difficulties, and they closed all their plants, including the Radford Pipe Works, and my position with them was ended. I was out of a job at the time we built the boat. The Radford Pipe Works is located on the banks of the river, about two miles west of the Radford station, not East Radford, but Radford station.

Q. You could see the river from where you worked at the Pipe Works?

A. Yes, sir.

Q. What made you think it was feasible to engage in the transportation business on New River?

A. The river looked fairly navigable to me, and no reason to think we could not operate a boat successfully, from my view point of the river. I had never been up the river above Ingles'
2137 Falls.

I mean I had seen the river from the bank. I certainly did have a different impression when I got out into the river. The boat was built just behind the Radford Pipe plant on the bank of the river. We built the hull upside down and turned it over and slid it sideways into the river and then built the superstructure. Walter Dudley did the actual building, and I was the handy man a good part of the time, and he also em-

ployed another man when he had parts to handle too heavy for one man.

Q. Had Mr. Dudley ever done any boating on the river?

A. Not to my personal knowledge, only from what he told me, and I considered him a very good mechanic and he proved it.

The boat had a sharp prow and blunt stern. It was approximately fifty feet long, maybe fifty-one or two, I don't recall the exact dimensions, and seven and a half to eight feet beam. The hull had a flat bottom, built along the lines of the old river bateau. We have carried as many as twenty-five or twenty-six passengers, not including the crew of three. The draft of the boat when it was light or empty, was very shallow, only four or five inches. The heaviest load ever carried was wheat, and my best recollection is we took thirty bags at a time, two bushels to the bag. I have not figured that out as to just what the weight would be. I would say that the boat with that load drew ten or twelve inches, not over twelve inches.

We had the boat on New River, a little over a year, or about a year from the time it was completed. We started to build it in July 1900, thirteen or fourteen months after I came to Radford, and we finished it in September 1900. It was on the river for approximately one year—until September 1901.

Q. What have you hauled with this boat as you recall?

A. We hauled very little except one car load of wheat for the Grayson Mill at Snowville, above the mouth of Little River, and we made, as I recall, eight or nine trips in handling that wheat, I should say fifteen or eighteen tons altogether, and we also carried several cargoes of lumber from just above the mouth
2138 of Little River to Radford, probably a mile and a half to two miles above, and I remember one cargo of shingles we brought down.

Q. You say you brought several cargoes of lumber?

A. Yes, sir.

Q. How many did you mean by that?

A. Not over five.

Q. How far is the mouth of Little River above Radford?

A. Five and a half miles approximately.

Q. Did you haul any other wheat than this one car load?

A. No; no more, because we found we could not handle it profitably.

Q. Mr. McWane, what did you intend or plan to haul with your boat when you built it?

A. We knew of this mill at Snowville, and they got most of their wheat by rail at Radford, and hauled it up by wagon to Snowville, and we thought we could save them money by boating it up from Radford to the mouth of Little River and in that way shorten their wagon haul by five miles or more.

Q. And did you have in mind there was any other commodity to haul?

A. We knew there was several small lumber mills in that district, quite a few shingles, and products of that kind produced by them up in there, and we figured we could possibly develop a business by bringing those down to the railroad.

Q. Hauling wheat up and bringing those back?

A. Yes, sir.

Q. But as I understood you, you never actually hauled more than this one cargo of wheat?

A. That is all.

Q. Did you ever haul any passengers, carry any passengers?

A. Yes, we took several. I don't recall how many, but several parties, excursion parties, picnic parties, some to the foot of Ingles' Falls and some over the Falls, used the sluice-way or channel.

2139 When the water was just at the right stage for us to go through the channel I suggested to my wife on one occasion she make up a party of her women friends in Radford, and we would give them an outing on the boat, and we took them up over the Falls to the mouth of Little River and on the way back we encountered some engine trouble, in the middle of the river, before turning into the landing, which was a few hundred yards below the Radford station, and the engine stopped, and we had to resort to poles to get to the shore and we worked frantically and just made shore, at the head of the rapids if we had ever gone over there, there would have been a tragedy.

Shortly after we launched the boat we invited a number of prominent business men in Radford, including Governor Tyler, who lived in Radford at that time, to make a trip with us, and that trip we only went up to the foot of Ingles' Falls. The purpose of that trip was purely a publicity stunt. We wanted to get all the publicity we could in the beginning of our enterprise. That was not only a publicity stunt, but to lay the foundation for our subsequent request, quite a few of them were asked that they write to our Congressman, Major Otey, and get his assistance in securing a Government appropriation to clean out the channels and restore the river to navigability.

We issued a little hand bill or printed announcement with a picture of the boat on it, and attempted to do a little local advertising. We prepared a petition to Congress and had quite a few people sign it, all we could get in a short time, including Governor Tyler, and quite a few letters written in addition to that, and we sent them to Washington to Major Otey. We saw a little item in our local paper a few weeks afterward covering some proceedings in Congress, at which Major Otey had offered

this petition, and he had been practically laughed off the floor. The resolution we were advised, presented by Major Otey was defeated.

Q. Was there any work, if you know, done on any point of the river during the time you were at Radford?

A. There was several dangerous obstructions in the channel through Ingles Falls and Dudley and two or three other
2140 men got in there before we made our first attempt to climb the falls and removed these rocks or rolled them to one side and cleared the middle of the channel, was all that was done.

Q. You mentioned a moment ago it was your desire to have the navigability restored, what did you mean by that?

A. Rebuilding the wing walls and deepening of the channel, so as to slow up the current.

Q. You said deepening of the channel——

A. Yes, so as to get more water in it, and enable us to get through in low tide, which was sometimes not possible.

Q. Can you describe the method of getting the boat upstream through Ingles Falls?

A. Well, we used the engine, sometimes we could go—depending upon the stage of the water—could go all the way through on the engine power, depending on the stage of the water, and other times we had to have help from poles, when the water was high and the current swift.

We would always have someone with us to pole, we had the boat equipped with poles. We had a big hefty negro, who was an old bateau boatman, to do the poling. I don't know just how frequently it was necessary to assist the boat by poling through the falls, but it was often necessary, I will say that.

Q. Did you ever see any obstructions in the river?

A. I can see them yet, I have seen them for the last thirty-five years.

Q. What are those obstructions?

A. Rocks and more rocks.

Q. Were you ever grounded?

A. No, but we were rocked, wasn't any ground under us, it was solid rock.

We had the boat at Radford from about September 1900 until sometime in September 1901. In September 1901 we de-
2141 cided we had made a financial and mechanical failure of it at Radford, and decided to take it to Hinton, West Virginia, in the hope of being able to either sell it or operate it profitably on a stretch of eight or ten miles of still water we understood was available above Hinton. We operated it at Hinton for only a few days. I will say probably two or three weeks.

I went to Lynchburg from Hinton within a couple of days and left the boat in Dudley's charge, and he wrote me that he was unable to do anything with it and I sold it in Lynchburg to a Mr. Eades—John Eades.

To build the boat cost me approximately $1,100. I was out of employment at the time I built the boat. I had saved this two or three hundred dollars during the year I was in Radford, during the year I was with the pipe work, and I borrowed $800 from the Radford bank through the influence of Captain Ingles, and that is how I financed it.

I sold the boat to Mr. Eades for $65.00. I had it loaded on flat cars at Hinton and shipped to Lynchburg by freight and he paid the freight and paid me $65.00. He used it as a tug to tow sand boats from the Glamorgan pipe plant in Lynchburg, up to Reusens, empty, and loaded there. Reusens is about six miles above Lynchburg. That is on a canal, there was a short stretch of canal available for traffic at that time, the old James River canal.

As I recall, this trip was made to Hinton between the 15th and 20th of September 1901. I would say the stage of the river on this trip from Radford to Hinton was five or six feet flood tide. We did not go down to Hinton as soon as we had decided to do so but waited for the flood tide before we attempted it. It would be rather hard to describe this trip. It was just one series of chute-the-chute all the way down, over one falls after another. In some places we made a sheer drop of five or six feet and struck the water with such force that I was fearful many times that we would jar the engine loose from the beams and put our power plant out of commission. On this trip we saw the same kind of boulders we had encountered higher up the river.

We got down the river all right, with the exception of one more or less minor accident, we stove a hole in the bottom
2142 striking a rock after shooting one of the falls. This hole was back near the stern in the engine room, slightly above the water line or about the water line. We did not merely knock a block out of the boat but we splintered the oak plank in the bottom. After splintering this plank, we didn't ship much water, only when she would rock from side to side, and we pulled in to the bank and got out and dragged the stern around upon the bank a few inches so as to get it out of the water. I don't remember getting into the water myself. Dudley got out; he was always equipped with hip boots and he waded in and did most of the heavy work. Dudley nailed a block on the inside and caulked around it and made temporary repairs. Pulling the boat

out and repairing it and getting it back, probably consumed an hour or a little more.

I was at a romantic stage and I called the boat by my wife's given name, "Altha."

Q. Was it because your wife was fond of the boat?

A. (Witness laughs.) I had rather not answer that question, please, sir.

Q. Do you have any records now, this little bulletin or dodger that you say you got out?

A. No, I haven't been able to find any scrap of record for many, many years.

Q. Do you have any idea what happened to them?

A. I suspect that my wife destroyed all of them.

Q. Why do you think she would destroy them?

A. Because she didn't feel greatly complimented by the outcome of the adventure.

We did not make the trip from Radford to Hinton in one day. We stopped with a farmer living near the mouth of Indian Creek some 15 miles south of Hinton, 15 miles up the river. I don't remember the exact distance, but I know we did not make Hinton that day, we stopped at a farm house on the right bank of the river near the mouth of Indian Creek. Mr. Dudley and myself went all the way to Hinton with the boat.

On this trip Dudley and I had a man along to help us in case we met with accident, but I do not recall his name. He
2143 was not in charge of the navigation of the craft. Dudley was the pilot all the way.

I don't recall ever having gone as far up the river as Towe's Ferry from Radford on the "Altha." I did not know the place by that name if I did. I never did take the "Altha" up the river with a bateau in tow. We did not engage in the barter of merchandise for produce. If I am privileged to elaborate on that a little, I might say that on our return trips from up the river, Dudley usually landed me on the Radford side, took the boat across the river to the New River depot side where it was tied up over night. There was a little grocery there and we may have taken a few groceries for him up into the country above Ingle's Falls and traded for produce but it didn't happen on more than one or two or three occasions. We were not engaged in the produce or grocery business.

The witness on Cross Examination testified as follows:

I am 63 years old. I was married in 1897. I was born at Wytheville, which is near Reed Creek, a tributary of New River. Wytheville is approximately an hour by train from Radford. I moved to Radford as manager of the Pipe Company in 1899. For two years after leaving Radford, I remained in Lynchburg

and then went to New York. I left Radford in 1901. I left Radford before I sold the boat. I left Radford for Hinton with the boat. I never came back to Radford to live. I have visited there. I now live at Ridgewood, New Jersey. I didn't move my family away from Radford until the latter part of October 1901. I was leaving Radford permanently at that time. My brother was at Lynchburg as manager of the Glamorgan works and he suggested that I come there with the idea of possibly giving me something to do. I went to work in Lynchburg with Mr. E. C. Wiley, a mechanical engineer and stayed there approximately two years.

Q. So when you left Radford in September of 1901 on your boat, going to Hinton, you were leaving Radford for good as far as you knew?

A. The idea was that we were to sell the boat in Hinton, if possible, and if not I was to sell Dudley my part, my
2144 interest in the boat, and he was to operate it.

Dudley had no interest in the boat. I paid him wages for most of his work. He had a small interest—we never really drew up any written contract as to the interests.

When I lived at Wytheville I was 15 years old. Following that time and until I left on the boat for Hinton from Radford, I was not in and around New River. I was never on New River but once in my life before going to Radford to work for the pipe works.

In April or May, I think, 1899, I took my family to Wytheville where my mother and father were living at that time, and left them and I went to Radford to get the work started and find a home for them. I was the local manager of the pipe works there. The pipe works was owned by the Virginia Iron, Coal and Coke Company. I left the pipe works in June 1900. I didn't resign my position with the company, it went into bankruptcy and everybody connected with the plant was out. Then I began looking about for something else.

I lived at Radford continuously from April 1899 until June 1900, before I embarked upon this enterprise of the boat. During that time I was never in the river, but I was near it. I had an opportunity to investigate and see it. After observing the river, from April 1899 to June 1900, I decided to construct the boat and to operate it on New River. The boat was built right on the banks of the river. The boat was built by Walter Dudley with assistance. I paid for the building of it, but I didn't personally build it. I had never built a boat or bought an engine for a boat. I had never operated a boat or operated an engine. I had never had any experience handling a boat on a stream. At that time I knew nothing about New River or its channels.

The engine for the boat was bought from Fairbanks Morse Company of Chicago. We didn't make any calculations as to what engine would be adequate for this boat. The boat was approximately 50 feet in length and about 7½ to 8 feet wide. The boat drew 4 or 5 inches when empty and 10 or 12 inches with a load of 2 tons or 2½ tons. I don't recall that we attempted to carry more than 2½ tons. There was a very short deck in prow to cover the gasoline tank, which was mounted
2145 in the prow of the boat. It was a gasoline engine. The deck in the prow was three or three and a half or possibly four feet long from the bow—the arch of the bow to the prow. There was a canvass roof built on a frame supported by posts secured to the gunwale and the middle or approximately the middle of the hull was an enclosed cabin with windows along the side, three or four windows. There were really two cabins, there was an engine room in the stern, possibly six feet long, running lengthways of the boat and there was a space of possibly 10 or 12 feet before the main cabin started, and that was about 12 feet long, and the remainder was open and only enclosed with curtains when it was necessary to enclose it. This passenger cabin was 12 feet long and the same width of the boat, with seats running lengthways on each side of the boat. We had a stove to heat it, we could sleep on the benches on either side, they were about 15 or 18 inches, I think they were rather narrow, but we could make down a pallet on them. We had used it several times when we went up above Ingle's Falls and decided to spend the night. The engineer's cabin was about 6 feet long, a small engine, it was a single cylinder, vertical engine, and didn't take much room. It was an eight-horse power engine, and I would say it weighed 300 to 350 pounds.

In paying for the construction of the boat, I sometimes paid Dudley in cash and at other times I would give him an order on a grocery store and I paid the grocer. I paid for the material. I paid $800 for the engine. That is what I got the loan for, to buy the power plant. I had the money to build the hull.

The power plant included the plans and specifications for building the paddle wheel and also included the shaft and bevel gears for operating it. The Fairbanks Morse people furnished us a little sketch showing how it was to be installed, they furnished instructions for installing it in the boat. Dudley and I installed the engine. Dudley before this time had never built engines before and installed them. My heavy financial loss was on this engine.

The first trial trip on the boat was sometime in the fall, the latter part of September or early October. The water is
2146 low in June, July, August, September, and sometimes Octo-

ber, as far as I remember, to the best of my recollection. We made the first trip in the boat to Ingle's Ferry, to the foot of the falls. The boat was empty. I went on this trial trip with Dudley and his father-in-law, Mr. Hedrick, who was with Dudley most of the time and helped him to build the boat.

We built the boat to carry passengers or produce, whatever we could make a profit on.

We went above the falls several times before we had the business men's trip. We would go through the sluice way, through the channel, near the middle of the river, when we went through the falls. As I recall the sluice way was near the middle of the river, I won't be positive as to that, it may have been a little to the right. Somewhat to the right, as you come down the stream, to the left as you go up, as I recall, it was a little nearer to the Radford side. I would say that the sluice way at Ingle's Falls was 10 or 12 feet. The width was rather difficult to determine on account of the condition of the walls. The walls had been washed in and boulders were lying scattered through the sluice way, and the water caught those rocks and whirled and twisted them around in different directions and it was rather difficult to accurately fix the width of the sluice way. The rocks were tumbled over in the sluice way. The rocks in the center of the channel had been removed.

When these rocks had been removed we went to Ingle's Falls. We operated the boat possibly a month before we took the business men's trip. We hauled no paying cargo at that time. We took some of our friends, just to show them the boat and try the boat out. It was a pleasure trip.

Almost the first trip we discovered that the engine was not carrying the boat as it should. Doubt began to enter my mind the first trip when we entered the falls and got about the middle and almost came to a standstill, and the wheel churning the water and the current racing by and roaring over the rocks on both sides and I began to think probably we had made a mistake. It was obvious that the engine was not pulling the boat through against that downcoming current. We rubbed rock almost continuously on all our trips, but there was no serious obstruction. On our first trip the boat was traveling almost
2147 empty. We later carried as many as twenty and even more up to the falls.

We began to realize when we reached Ingle's Falls on our first trip that our engine was mechanically inadequate. The necessity for helping the engine by pushing the boat depended upon the stage of the water. There were times when the boat would go up fairly well and there were times when we had to help it, when the river was high, what you might call flood tide, that is

considerably above normal, when the current was very swift, we would have to help.

The lumber we used on the bottom of the boat was three-quarters to seven-eighths inches, oak. I would say the whole boat would weight a ton and a half—3,000 pounds or possibly a little more. We hauled as many as 20 *ro* 25 people on the boat.

On the trip we made with the business men, on the advertising project, creating interest in the river, we circulated a paper and sent it to our Congressman. The paper requested that an appropriation be made sufficient to clear out the sluice way and rebuild the walls so as to carry more water into the channel and if necessary build small locks where it was absolutely essential and the current was too swift. I asked for everything I thought we could get. There were 8 or 10 on this business men's trip, I don't know how many. We went to the foot of Ingle's Falls. We didn't attempt to go through Ingle's Falls.

Q. Following the business men's trip, you used the boat for the entire year until you took it to Hinton in 1901?

A. Not the entire year. It was tied up practically three months during the winter. The ice conditions in the river were such that we could not operate.

Q. You did operate up to the time of the ice conditions and resumed operations sometime in the early winter or spring of 1901?

A. Yes, sir.

Q. And operated all through that summer of 1901?

A. Not daily, because we did not—sometimes a week would pass that we did not make a trip for the reason that we had nothing to do and gasoline was expensive and it was expensive to operate.

2148 Walter Dudley operated the boat, I never did operate it. The set-up of the crew was Walter Dudley, skipper, and myself as first mate and engineer; and Dudley's father-in-law as second mate; and Harvey Gunn, the big negro as stevedore and boatswain. We had four on the boat, sometimes we had a crew of three. Harvey Gunn was the pole man on a bateau in the old days. He had been a pole man on a bateau on this stretch of the river from north of Little River to Radford, when he was a young fellow and the channel was first improved, I don't know just how old he was at the time he worked for us, but he used to tell us his experiences in poling boats up and down the river.

I had never seen a bateau when I built this boat. A bateau had been described to me by Mr. Dudley. He had seen them on New River. He lived there all his life.

We had picnics and excursions and carried goods of various kinds. The wheat that we carried was for Grayson's mill. Jim Grayson had a mill at Snowville and we carried that wheat there in 1901. That was a single carload—15 or 16 tons, a minimum carload. The wheat was hauled from Radford. The siding was near the West Radford Station—there was a little lumber mill plant there between Radford and East Radford and they had a siding, and I remember that is where the wheat was loaded. We took it to the mouth of Little River. We made 8 or 9 trips with the wheat over Ingle's Falls.

We had gone several miles further than the mouth of Little River in the boat. We went more than a mile above the mouth of Little River on these trips. We were not carrying anything up there on these trips as I recall. We brought down a little lumber—4 or 5 cargoes of lumber from the mills back in the hills there.

I think I remember a man by the name of Till O. Meredith. I heard him speak of cutting and shipping lumber on bateaux down the river.

I cannot tell you what my first month's receipts or income was on the boat. I kept a record of it, but it is gone.

We had about 10 or 12 aboard at the time we made the ladies' excursion trip. That is the time we came near to having a disaster, the engine stopped.

2149 Q. It was, as a matter of fact, the mechanical difficulties in the operation of the boat with this small engine were such that you finally had to give it up?

A. Yes sir; the mechanical and physical difficulties; yes, sir.

Q. If the engine was larger, you could have operated more easily than you did up the river?

A. Possibly.

Q. And even with this inadequate capacity, you made trips up the river through Ingle's Falls and beyond?

A. Yes, sir.

Q. And carried many people and considerable produce?

A. Yes, sir; but always with the help of poles.

Q. You did operate the boat from September 1900 to September 1901?

A. Yes, sir; with the exception of the times I spoke of.

Q. With the exceptions of the times you spoke of—the winter time when the river was frozen.

A. Yes, sir.

Q. How much of a cargo of wheat were you carrying each time in carrying wheat, in pounds or bushels, if you can give it?

A. Twenty or twenty-five bags.

Q. How much would each bag weigh?

A. I think there were two bushels to a bag.

We carted the wheat from the railroad siding to the landing. So far as I remember, the wheat came in on the Norfolk and Western. It came from the west somewhere, because Mr. Grayson was buying western wheat at that time. It was not local wheat; it was not Virginia wheat. It came from out of the state.

I carried the cargo of shingles to Radford from several miles above the mouth of Little River. I don't recall but one load of shingles. The shingles did not belong to us; I don't know who they belonged to. We simply unloaded them and they were taken by the parties to whom they were consigned. We
2150 did not put them on the railroad track, they were evidently for local consumption. The railroad did not run from Radford up New River at this time. There was a siding to the pipe works from Radford, as far as the pipe works. The railroad went up Cripple Creek. I never was in that country and I don't know anything about it. We carried several cargoes of lumber on the boat. We got the lumber above the mouth of Little River, near the mouth of Little River, and hauled it to Radford. We hauled this lumber on 4 or 5 occasions.

Q. When you came to sell your boat and leave Radford, how many went down to Hinton with you?

A. As I recall, there were four men on the boat.

Q. Do you remember Whit Coleman—T. W. Coleman?

A. I don't recall his name.

Q. Do you remember that he went?

A. Yes, I am satisfied he went, if he said so. There is no question about that, and Mr. Grayson, and Mr. Dudley, and I.

Mr. Dudley did the steering of the boat to Hinton. I don't recall Mr. Coleman doing any, he may have done some in the still waters. I would not say Mr. Coleman was mistaken, if he says so, but he did not steer over the falls, because Mr. Dudley would not trust the wheel to anyone.

I don't recall the name of the falls. I didn't make any effort to fix names of the falls in my mind. The trip seemed a continuous trip of falls to me. None of us had made this trip before. There were pools of considerable length on the way to Hinton on New River, but they did not impress me so much as the falls. I do not know the location of the place where we had the six foot drop. I cannot locate it with reference to some point on the river. I cannot say whether it was in Virginia or West Virginia, or near Glen Lyn or Narrows, it was somewhere between Radford and Hinton. I don't know which side of the river it was on; it may have been in the middle.

On several occasions on these smooth stretches of water, before we reached the falls, Mr. Dudley, who seemed to know about it, would run into the bank and get out and walk down maybe a quarter of a mile and view the falls from below and pick
2151 his route over them. It was new to him, none of us had ever been there. We may have seen this 5 or 6 foot drop, but that was the only way to go over. We did go over, and how! There were several of these falls. Mr. Dudley did not get out and look at all of the falls—occasionally he did.

Q. You testified about some board on the boat being stove in some place above the water line—where?

A. On the side where the curve begins.

Q. That was the only actual accident to the boat on the entire trip, was it?

A. Yes, that was the only accident. We struck other rock—scraped over them, but there was no damage.

Q. Outside of that, your trip was without mishaps whatever.

A. There was considerable excitement, but no mishaps.

Q. When you came to the falls of five feet drop, was there any other place in the falls that you could have gone down or through except where the drop was?

A. I don't know; if there had been, we did not have time to find it after we started over them.

Q. And you did not stop to find them—you did not tie up at all?

A. No, sir.

I don't know how far it was above Hinton, or how far below Radford that we had this five foot drop, it was during the trip—possibly around the middle of the day.

We reached the mouth of Indian Creek in the evening about four or five o'clock. We left Radford about eight or nine o'clock in the morning, about 8:30 in the morning, and reached Indian Creek about five o'clock in the evening. That was in West Virginia. I don't know the distance from Hinton to Radford. I suppose we traveled about 65 or 70 miles the first day. It took us an hour or so or a couple of hours to go from Indian Creek to Hinton. We had good water all the way. We did not rush into Hinton. Between the mouth of Indian Creek and Hinton, we must have gone over Bull's Falls, because it is below Indian Creek.

2152 The witness on Redirect Examination testified as follows:

I am a mechanical engineer. Mr. Walter Dudley was a very good mechanic.

I should think we took no more than 35 or 40 trips from Radford to the mouth, or above the mouth of Little River.

I would say the stage of the river when we went from Radford to Hinton was 4 or 5 or 6 feet. I don't know just what. We had no means of measuring the stages of the river. We had no gage. There may have been a gage, and possibly was a gage on the abutment of the New River wagon bridge, but we did not notice it before we left. We did not know what the stage was, but Mr. Dudley took a chance because he thought there was sufficient water to get him to Hinton. There was at least 4 or 5 feet of water above normal.

On the first trip I made to Ingle's Falls, I had perfect confidence in the engine being built to carry the boat over a reasonable current, but it just began to dawn on me that the current was just too strong; that we could not, without some change in the structure of the sluice way—that we would not be able to make that falls under our own power. At that time, we figured that if we had a much more powerful engine and loaded the boat too heavily, we would not have room for any cargo, because the river was so shallow in places. With the increased draught we would get to the point where we could not carry very much cargo.

Harvey Gunn who assisted in poling the boat weighed about 200 or 220 pounds, over 200 pounds. Mr. Hedrick, Mr. Dudley's father-in-law, was the other pole man on the other side of the boat. This boat had a wide gunwale, probably eight inches wide, so that you could walk from one end to the other, but no room for one pole man to pass the other on the return trip, so the paddle wheel had to hold all that the poles took before the pole man could get back to the bow and start his return trip, and frequently the paddle wheel would not hold and we would lose possibly half of what we had gained with the poles. That is the reason it took so long to navigate some of the falls. We did not try to climb any of the falls except Ingle's or any sluice ways. We did not attempt to go any further up.

2153 The witness on Recross Examination testified as follows:

It was a flat bottom boat. It not being a keel bottom boat, on that spread, we could carry a much larger cargo than a keel bottom boat.

We frequently scraped the bottom, because the river at that time was very muddy, owing to the washing of iron ore up in the upper stretches of the river at the ore mines. They were washing ore and dumping the waste into the river and that muddied the stream so that we could not see the bottom and we could only judge; and Mr. Dudley seemed to have an unusual ability to judge the depth of the water over an obstruction by the ripple on the surface, and yet even with that, we frequently

scraped these boulders. Mr. Dudley had had long experience on that stretch of the river as a boatman.

When I decided to take the boat from Radford to Hinton, I waited for a high tide. There were some rains and they produced an abnormal rise in the river. We had a rain like that in the spring. There was a rise from every normal rain. It was a rain that caused the river to rise when we went to Hinton on the high tide, rains up in the mountains.

2154 At this point Wendell Forbes, attorney for defendant, introduced the following Exhibit, which was read into the record:

Defendant's Exhibit No. 547. Four pages; namely, page 848 of the Congressional record for January 10, 1901; page 1001 of the Congressional record for January 14, 1901; page 1002 of the Congressional record for January 14, 1901; and page 1096 of the Congressional record for January 16, 1901.

2155 FRANK P. TURNER on Direct Examination testified as follows:

I am 61 years old and live at Roanoke, Virginia. I am civil and structural engineer for the Norfolk & Western Railway. I am principal assistant engineer of that railroad.

I have made an investigation of the records of that company, to ascertain certain dates when certain parts of this road were put in operation. The records contained in the annual reports of the president and board of directors to the stockholders each year during the period of this construction, which cover the time between 1850 and 1856, indicate that the main line of the Norfolk & Western between Lynchburg and Wytheville was completed through to Bristol in 1856—completed and operated to Bristol, Virginia, in 1856. The exact date of that was October 1, 1856. The record shows that a part of that line was completed and placed in operation through to Big Lick, which is today called Roanoke, in the latter part of 1852. It was completed to Salem, Virginia, December 15, 1852. It was completed to Big Spring, now known as Elliston, August 10, 1853. The track was laid within three miles of Wytheville, 136 miles from Lynchburg, as contained in the report of October 25, 1854. The chief engineer's report, as also contained in this particular annual report dated October 18, 1855, states the track was finished 13 miles west of Wytheville. In the report of October 29, 1856, the statement is made that the road was completed and in use October 1, 1856, to Bristol, Virginia.

The annual report mentioned is a report of the president and board of directors to the stockholders, which covers the conduct of the work during any particular year. It names the officers,

directors, a brief description of the property, the income, the expenses, financial statistics, improvements of all kinds, and many other classes of information. This is a report which the officers of the company make to the stockholders annually of their conduct of the business during the past year. These reports are
printed each year in pamphlet form, and the particular
2156 ones to which I refer, after a number of years, are
grouped together in book form, with the original printing, and bound together in book form. These are based on the data gotten from the engineer's office with reference to construction matters. These reports state that the road from New River Depot to Pocahontas, Virginia, was open to traffic in May, 1883, and from New River Depot to Winona, near Pearisburg, in January 1883.

With the exception of slight improvements where curvature may have been reduced, and with the further exception of one low grade line near Radford that was constructed during the years 1899 and 1900, the road to Pocahontas is essentially on the same location as it was originally.

With reference to the low grade line near Radford which I mentioned, when the road was first built, it left the main line at New River Depot and ran in a northeasterly direction on the north and west side of New River; it crossed over the hills, and extended in a general northward direction until it touched New River again at Back Creek.

During the year 1899 it was determined to build a low grade line, and, thereby, avoid the heavy grade crossing the hill opposite Radford, and this low grade line would follow New River, beginning at a point about two miles east of Radford, turning down New River, whereas the road towards Bristol turned up New River.

This line was constructed between 1899 and the latter part of 1900 on the location down New River, crossing New River, about between 4 and 5 miles below Radford, passing through a tunnel and continuing from that point on the west side of New River along its left bank until it joined the original location at Back Creek. At the time that cut-off was built it was called the low-grade line from Crab Creek to Back Creek. It was also called the Walton connecting branch. The name of that tunnel is Pepper tunnel. It is known as Pepper tunnel today. The bridge across New River is known as Pepper bridge and Pepper's ferry is about one mile south of this tunnel and bridge. Pepper's ferry
is up stream. From the annual report of June 30, 1901,
2157 the following has been taken: "New River connecting
branch opened to traffic October 11, 1900." That refers to that so-called low-grade line.

The records taken from the annual report of December 31, 1886, show that the Cripple Creek extension 22.5 miles, Pulaski to Foster Falls, was placed in operation October 6, 1886. The record does not indicate that any part or section of that road was placed in operation, prior to that time. The record indicates that during the year 1884 after the work had been started in 1883, from Pulaski to a point near Ivanhoe, a distance of about 47 miles, that work was suspended during 1884, on account of financial conditions; was resumed December 1, 1885, and completed and operated by October 6, 1886. The record showed that at the time of suspension the grading had been almost completed over the 22.5 miles, but it does not indicate any part had been operated. I am unable to say that any tracks had been laid. From my investigation I did not see any statement in the report showing any tracks had been laid.

The following notation appearing on Defendant's Exhibit marked for identification 548, showing when the parts of the Norfolk & Western Railroad I have been talking about were placed in operation are correct: "From Radford to Wytheville, placed in operation October 1, 1856." This is correct according to the record in the annual report of the railway company. "From New River Depot to Pearisburg, placed in operation January, 1883, and completed line to Pocahontas was placed in operation May 21, 1883." These dates conform to the information I have found on the official records of the company. On the section from Pulaski to Foster Falls, which shows placed in operation October 6, 1886, that information is correct, according to the official records of the company.

The witness on Cross-Examination testified as follows:

I think the work commenced on the Cripple Creek branch in 1883. There was then an interruption of the work for about one year, in 1884. As I recollect it said that the interruption was due to financial conditions. I did not examine that report with any degree of care to follow that up.

2158 Q. You understand from that, do you not, it wasn't directed to any particular financial condition of the company, but to financial conditions generally throughout the country, which did not justify the going forward with the project at that time?

A. I could not say just what brought that about.

Q. That was your understanding?

A. Yes, sir.

Defendant's Exhibit No. 548, being a map entitled "Railroads in relation to New River showing approximate locations and dates of completion," offered in evidence.

J. B. SNETHLAGE on Direct Examination testified as follows:

I am 39 years old and live at Hawthorne, New Jersey. I am a civil engineer, associated with Daniel W. Meade and F. W. Scheidenhelm, Consulting Engineers, New York.

The line and the notation "placed in operation 1873" appearing on the map marked Defendant's Exhibit 548 refers to the year in which that part of the C. & O. Railway shown on this map was placed in operation. The part of the Chesapeake and Ohio Railway shown on that map is along New River; a small part along the Greenbrier River, from Lowell past Charleston, in the State of West Virginia. I derived the information for putting on that map that part of the line which was placed in operation in 1873, from a book entitled "History of the Chesapeake and Ohio Railway Company," by James Poyntz Nelson, Special Engineer of Valuation, dated February 24, 1927, and printed by the Lewis Printing Company, Incorporated, Richmond, Virginia.

The witness read the following from page 1, first paragraph of the book referred to above by James Poyntz Nelson: "The story of the Chesapeake and Ohio Railway Company, its subsidiaries and antecedents as contained in the testimony of James P. Nelson, Special Engineer, Valuation, at its Valuation hearing February 24, 1927, before Examiner Conway of the Interstate Commerce Commission, at Washington, D. C., in Valuation Dockets 457-477."

2159 I have not read all of that book.

By Mr. ABBOT. While I don't mean to be testifying, Mr. Nelson was, I think, about the oldest engineer in the service of the Chesapeake & Ohio at the time of the valuation hearing, and he had worked on practically all of the original construction of the Chesapeake & Ohio, and he prepared that history, which was read into the record and it is the history of the railroad company as appears in the Valuation files of the Interstate Commerce Commission, and is published by the company.

The information I have been speaking about was obtained from that book on page 16 and page 29. Page 16 states that the successful "Linking of the waters of the Chesapeake with the waters of the Ohio was completed January 29, 1873, when the rails from the west and the east were connected." On page 29 it is stated: "In 1873 it was possible to put trains over the line on the New River Canyon but the work of construction was by no means completed."

The witness on Cross Examination testified as follows:

This chart, Exhibit No. 548, was prepared under my direction. I believe that the location of the various lines of ra way down the New River below Hinton, that is from Hinton, down to the Kanawha, is as accurate as can be shown.

The line going across the chart on which is the inscription "Placed in operation 1873" has reference to that portion of the Chesapeake and Ohio up the New River to Hinton, and thence up the Greenbrier and has no reference to the Virginian Railroad, which line it crosses near the center of the chart.

2160 A. A. L. MATHEWS

DIRECT EXAMINATION

Q. Mr. Mathews, will you state your full name and residence for the record?

A. A. A. L. Mathews; Blacksburg, Virginia.

Q. What is your present occupation?

A. I am in the Department of Geology in the Virginia Polytechnic Institute, Blacksburg, Virginia.

Q. Where were you educated, Mr. Mathews?

A. I received my Bachelor of Arts Degree from the Iowa Teachers State College in 1907.

In 1924 I received Master of Arts from Leland Stanford Junior University, Stanford, California.

I have completed all the work required for the Doctor of Philosophy Degree from the University of Chicago with the exception of my final examination. My thesis, which was on a geology subject, has been accepted and published in 1929.

In both Stanford University and University of Chicago my major work was in the Department of Geology.

Q. What did you do after you graduated from Iowa State Teachers College in 1907?

A. After teaching in secondary school, I was instructor at Miami University, Oxford, Ohio, during the period from 1911 to 1915.

From 1915 to 1929 I was professor of geology in the University of Utah, Salt Lake City, Utah, with the exception of the school year 1927-28, when I was lecturer in geology in the University of Chicago.

In 1929 to 1931, I was professor of geology in Oberlin College, Oberlin, Ohio.

From 1931 to 1935 I was occupied with various occupations in geology, a part of the time doing commercial assignments, and at different times acted as field geologist for the State Geological Survey of Virginia.

2161 Since 1935 I have been in the Department of Geology at the Virginia Polytechnic Institute.

Q. Have you any specialty in the field of geology, Mr. Mathews?

A. I have specialized in stratigraphy. That is that branch of geology which deals with the composition and structure of the rocks which form the earth's crust. That branch of geology which deals with the ore position of the rock strata is also called structural geology.

Q. Mr. Mathews, have you had published any papers or articles upon professional and scientific subjects?

A. Yes, in 1925 an abstract of my paper on Low Angle Unconformatives in Eastern Utah, was published by the Pacific Coast Division of the Geological Society of America.

In 1929 my Doctor thesis was published as Walker Musen Memoir, volume 1, No. 1.

Q. Anything further?

A. In 1930 (I think it was 1930 or 1931) an abstract was published of my paper on the Thrust structure of Central Wasatch Mountains, by the Geological Society of America.

In 1934, I think it was, an abstract was published on my paper on New Lights on Giles County Structure, by the Virginia Academy of Science.

Previously, I think in 1930, a paper of mine of the Narrows section, Virginia, was published by the Ohio Academy of Science.

In 1934, the Virginia Geological Survey published Bulletin 40, my report on Marble Prospects of Giles County, Virginia.

In 1935, an abstract of my paper on Further Lights on Giles County Structure, was published by the Virginia Academy of Science.

I have various other publications, some of which have been referred to by men of my profession.

Q. What, if any, field experience have you had in geology?

A. Besides the field work in the Virginia Geological Survey, I have served as field geologist for several private individuals and corporations in the States of Utah, Wyoming, California and West Virginia.

Q. Are you now engaged in work for the Geological Survey of Virginia?

2162 A. There are occasions during vacation when the Geological Survey of Virginia engages me in field work.

Q. You referred to your study of geology in Giles County; State whether or not that was work for the Virginia Geological Survey?

A. My first assignment in Virginia was to study, map and reports on the geology of Giles County, Virginia. The results of this work are nearly completed and will be published as a bulletin by the State Geological Survey.

Q. In your study of the geology of Giles County, did you have occasion to become acquainted with New River?

A. I did.
Q. And what section of New River did you have occasion to come acquainted with?
A. I studied intensively that section that is included in the undary lines of Giles County.
Q. In that study, did you have any opportunity to observe d study the relation of geological factors to the physical char-teristics of New River?
A. I did.
Q. Did this study have anything to do with the suit in which u are now testifying?
A. It did not. I made this study for the State.
Q. Mr. Mathews, have you stated fully the part of New River hich you studied?
A. No. It was my privilege, as geologist for the State, to study lationship immediately outside of the boundary, but no con-derable distance from the boundary line of Giles County.
Q. What determines the physical characteristics of New River?
A. The physical characteristics of New River are determined y the geology of the area through which it flows.
Q. Please explain, Mr. Mathews, how it is that the geology of is region is controlling with reference to the characteristics of New River?
163 A. In the region along the river, extending for about 35 miles up the river from Glen Lyn, in that region the eology is of such nature that the relationship between the eology and the physical character of the river involve two pri-ary laws of nature. One is that in their down grade or down ill movement, rivers always seek the easiest course. The other that a river does not widen its bed or channel laterally until has attained its ultimate and relatively flat grade.

By Mr. THOMPSON:

Q. Do you mind saying that again?
A. The other is that a river does not widen its bed or channel terally until it has attained its ultimate and relatively flat rade.
The first of those, I think, needs no explanation. The second eans that, given time, a river will eventually adjust itself to e geological environment and will adopt for itself the easiest ourse which is available.

By Mr. JACKSON:

Q. Will you explain what is the easiest course for a stream follow, in this geological sense that you have defined?
A. In a region where the rock formations are near the surface, nd especially where those formations are of hard or resistant

rock, the easiest course is to follow the trend or direction of the dipping strata. Those streams usually follow along out-cropping strata which are relatively easy to erode, and remain away from strata which are relatively hard or resistant.

When, however, streams which have rather steep gradients or slopes are forced by physical conditions to cross out-cropping ledges of resistant rock, the streams, in general, will do such crossing at right angles to the trend of the rock strata. That is, in other words, if the rock strata is this way [illustrating], the river flows this way [illustrating], at right angles to the trend of the strata.

Q. Has this second geological law that you have mentioned any bearing upon the present condition of New River?

A. No. New River is what we geologists call a young stream. That is, it has not yet completely adjusted itself to the
2164 geologic environment. It has not yet cut down through its length to such level that it has a low gradient or slope. It is still in the process of cutting down vertically through these rock strata.

Q. Is there anything unusual about the geological environment of New River, this 35 mile section upstream from Glen Lyn, or the Giles County lower line?

A. From the standpoint of the geologist, the geologic environment of New River is markedly unusual. The region has been folded and faulted—that is broken. At one time, millions of years ago, the rock strata now represented in the area were horizontal, but, due to the great earth forces exerted during the geologic ages, the rock strata were folded, twisted and broken. So intensive has this warping and breaking of the rocks been, that various rock strata, which normally were at the bottom, so to speak, have been thrust up and over rock strata which ordinarily would lie uppermost.

This particular area of New River has been the scene of four predominant breaks or faults.

Perhaps the most unusual thing about the geologic condition in the region in point is the concentration of the folding and faulting within the relatively narrow area—that is the distance from Glen Lyn up stream to the south limit of Giles County. Elsewhere, northeastward and southwestward from the area and away from New River, there are these same faults, major faults. But in that area they are much wider apart. In other words, the faulting away from New River is less concentrated.

Q. Mr. Mathews, what is the result of such folding and faulting, so far as the physical characteristics of New River are concerned?

A. As is frequently the case with faults, the faulting in this area has resulted in the tilting of the rock strata, and, due to the concentration of the faultings, the strata are largely tilted to a very steep degree. In many cases they approach the vertical. The prevailing slope of the strata is downward, in a southeastward direction. This means that such slope or dip is southeastward.

By Mr. THOMPSON:

2165 Q. That is from northeast to southeast?

A. No, sir. The slope of the rock strata is towards the southeast. It would be from northwest to southeast. This means that such slope or dip is southeastward—that is prevailing in this section in an up-stream direction.

By Mr. JACKSON:

Q. What, if anything, does that condition or situation have to do with the physical characteristics of New River?

A. In its flow, the water of New River moves along and up the slopes of successive rock strata or ledges, and frequently falls over the upper or out-cropping edges of these ledges. In many cases, the falling over of outcropping edges is practically sheer or perpendicular. This is especially true where the water flows over the top of a stratum which is relatively resistant and which lies upstream adjacent to and from the strata which is relatively non resistant.

In other words, this results in a river with numerous ledges of rock strata, some partly submerged, some exposed, which are substantially vertical or standing on end, and which extend across the stream at right angles to the line of flow, this condition results in a stream with numerous submerged ledges, forming shoals, rapids, and falls.

Q. What is the composition or character of these strata which you have described as relatively resistant?

A. They are sandstone, limestone, dolomites, flint beds, and so forth. These are more resistant than the shale or shaley sandstone or shaley limestone found here and there. Generally, the out-croppings of the resistant rock strata extend at right angles across the stream.

Q. Is there any geological reason for the fact that this strata extends at right angles across the stream?

A. Yes. That is due to what I have already referred to as a primary law, namely, that when forced to cross a resistant rock strata, the steeply sloping streams generally do so at right angles to the trend of the strata. That is a usual phenomenon in nature.

By Mr. THOMPSON:

Q. When you speak of these sandstone and limestone and dolomite regions, are they the ones you say are resistant?

2166 A. They are resistant.

By Mr. JACKSON:

Q. What, if anything, is unusual, geologically, about this situation you have described in this section of New River that you have studied?

A. First the concentration of the strata which dip fairly steeply and are composed of resistant rocks; second, the fact that the prevailing slope is downward in an up-stream direction rather than in a down-stream direction.

By Mr. THOMPSON:

Q. Upstream instead of down-stream?

A. Upstream. The slope of the strata is downward in an up-stream direction rather than in a down-stream direction.

In the case of most streams flowing over sloping rock beds, the slope or the dip is downward, in a down-stream direction. Here, however, the reverse is true.

By Mr. JACKSON:

Q. Mr. Mathews, can you give any instance where the effect of these geological conditions is shown in the profiles of New River?

A. The greatest concentration of out-cropping ledges with steep slopes, and composed of resistant material, exist in the vicinity of the Big Falls in the uppermost Giles County line and in the vicinity of the Narrows.

By Mr. THOMPSON:

Q. What do you mean by the Big Falls?

A. The falls in New River between Gap Mountain and Walker's Mountain.

By Mr. JACKSON:

Q. Are those known as the Walker Mountain Falls?

A. I never heard them so designated.

Q. All right.

A. One day, from a point on the right side of New River above the Virginian Railroad track, opposite Dry Branch (that is the stream); I counted, by looking down the river, 86 riffles. 45 distinct riffles or falls were counted in the first 7/10 of a mile below the ferry at McCoy.

2167 Q. That is 45 what?

A. 45 riffles were counted down-stream.

Q. Mr. Mathews, what effect, if any, do these geological conditions you have described have upon the depths of water?

A. In general, immediately upstream from a riffle or fall, the water is relatively shallow; while immediately downstream where relatively nonresistant rock has been eroded, the water is somewhat deeper.

Q. Mr. Mathews, you referred to New River as a young river; will you explain a little more fully as to that?

A. New River is young in the sense that its valley and bed have not yet attained their final form and level. On the other hand, so far as concerns the existence of the stream in this geographic vicinity, New River is very old. There are few rivers on the American continent which have existed for a greater length of time. Historically speaking, New River is old. Physically speaking, New River is young. The latter fact is evident by the limited number and extent of flood plains.

Q. Will you explain a little more fully what you mean by your reference to the limited number and extent of flood plains?

A. The stream is still engaged in cutting or eroding downward; its slope is still steep, thus it still has velocities of flow so high there is little or no opportunity for cutting out enough widths of the stream bed so that a flood plain can build up.

Q. Mr. Mathews, in the course of your study of the geology of New River in this thirty-five mile section in Giles County, did you take any photographs?

A. Yes, sir; I took several photographs.

By Mr. JACKSON:

I produce an album of photographs, containing twenty-seven photographs, marked 1 to 27, respectively, and ask to have the album marked as Defendant's Exhibit #549, for identification.

Q. Mr. Matthews, I show you a book of photographs marked Exhibit #549 for identification, and ask you whether those photographs were taken by you?

A. They were taken by myself.

Q. All of them?

A. All of them.

Q. And approximately when were they taken?

A. The majority were taken in the summer of 1931.

Q. And are those legends under the photographs intended merely to show the location of the picture and the direction in which the camera was pointed?

A. That is all. The numbers refer to the album number.

Q. Were these pictures taken by you for the purposes of this case?

A. They were not. They were taken for the State of Virginia.

Q. And do those photographs in Exhibit #549 marked for identification, numbered 1 to 27, accurately and truthfully portray the scene which met the eye at the time and place where those pictures were taken?

A. They do.

Photographs marked 1 to 27, respectively, were introduced in evidence and marked Defendant's Exhibit #549.

Q. Mr. Mathews, in taking these photographs, did you have any occasion to cross New River?

A. I did.

Q. And how did you cross New River?

2168 A. I crossed New River by bridge, on a ferry, and at one time I waded the river.

Q. Where did you wade the river?

A. In the vicinity of Dry Branch.

Q. How deep was the water where you waded the river?

A. At the deepest place it was a little below my knees.

Q. And on that particular occasion, did you recross the river?

A. I did.

Q. And how did you recross it?

A. I waded back.

Q. Now, Mr. Mathews, will you take the album of photographs, Exhibit 549, and beginning with #1 state what those photographs show?

A. Photograph #1 was taken from the Virginian Railroad bridge, above Glen Lyn, looking downstream. The photograph was taken to show the evidence of suggestive upheavals of the earth in this area, and the result of New River cutting down through those upheavals. In the center part of the photograph is a line that appears to be the contour of the distant mountain. At the top, near the skyline, is a level. That level represents the elevation of the surface that New River flowed over at that time. Since that time it has cut down to its present position.

Q. How long ago was it New River flowed at that level?

A. Well, we geologists refer to geologic time in terms of geologic time. That level is what is known as the Tertiary peneplain.

Q. Is that in the order of hundreds of years or thousands, or what?

A. No, it would be millions of years.

Q. Does that picture #1 show any riffles?

A. It does show some riffles in the immediate foreground, above the bridge.

Q. Have you finished with Photograph #1?

A. Yes, sir.

Q. Turn now to Photograph #2.

2169 A. Photograph #2 was taken at the first bend of New River, above Glen Lyn. It was taken for the express purpose of showing how rock strata trends across the bend in the river. It can be seen by this photograph that the strata trends completely across the bend of the river, thus the river cuts across the same strata twice.

Q. Will you now turn to Photograph #3?

A. Photograph #3 was taken a little distance below Lurich. It is looking downstream. It is at the opposite end of the strata that was represented in the preceding photograph. Here it can be seen that the rocks stick up almost vertically, in a southeasterly direction.

Q. Proceed to Photograph #4.

A. Photograph #4 was taken especially to show New River Valley in the Narrows. You can see in the distance that the river occupies practically the complete width of the nitch or gorge formed by itself. In the foreground are several islands. In this picture one can observe five different rapids.

Q. Will you turn now to Photograph #5 and explain that photograph?

A. Photograph #5 was taken a little above Rich Creek, probably a little less than one mile. The direction is across the river toward the southwest. This shows resistant strata outcropping on the opposite bank. It is the type of strata that forms ledges and outcrops across the river.

Q. Turn to picture #6, if you have completed with #5.

A. No. 6 represents the lower outcrop of the lower falls in the Narrows, where the resistant strata is dipping in a southeastward direction, or in an upstream direction.

Q. Is the dip steep or otherwise?

A. The dip is relatively steep.

Q. Will you proceed to describe #7?

By the COURT:

Mr. Mathews, in Photograph #6 the mountain side—there seems to be streaks or lines there—is that the outcropping strata there?

2170 A. It is your Honor, and that cut by the Norfolk and Western exposes the general inclination of the rock strata.

A. No. 7 is the upstream portion of that lower section. Here again the rocks dip in an upstream direction.

Q. What kind of rock is that?

A. That rock is resistant ledges of sandstone.

Q. Go ahead with #8.

A. #8 is a picture showing the falls of New River.

Q. Where?

A. In the Narrows.

By Mr. THOMPSON:

Q. Is this the big falls?

A. No, this is not the big falls. These are the falls of New River in the Narrows below Narrows, Va.

By Mr. JACKSON:

Q. Will you proceed?

A. These falls are formed by very hard and resistant sandstone, what we geologists call the Clinch sandstone. Here again all of the strata are shown to be dipping upstream.

No. 9 is the lower bed of the preceding falls, just a closer view of them.

Note in the right hand corner of the picture that the water running over the outcrop falls almost vertically.

No. 10 is another view of the falls in the Narrows. The camera is pointed a little upstream showing the complete width of the falls in the Narrows.

No. 11 is another view taken from the northeast bank of the river, looking toward the southwest of the falls at the Narrows, where we have practically the complete outcrop of the Clinch sandstone, which forms these falls.

Note again that all the strata represented in the picture shows a southeastward dip or a dip upstream.

Photograph #12 is the lower portion of the rapids,
2171 above the falls at the Narrows. Here again is a resistant stratum of sandstone that is dipping upstream, and here again the water flowing over the upper edges of that stratum, falls almost vertically.

No. 13 is a general picture of the rapids above the falls of the Narrows. In each of the lines crossing New River there are, or there was at this particular time, almost vertical falls.

In No. 14 we have a little different situation. This picture is taken at the west end of Pearis Island, at Bluff City, Virginia, where the rock strata dip downward in a downstream direction. The river flowing across the upper edge and running down the downstream dip of the stratum.

You will note in this picture that the break in the water is very much wider and much more gentle than shown in the preceding pictures.

Q. Has that anything to do with the tile of the stratum?

A. It is due to the tilt of the stratum, this is the type of fall or rapid that usually occurs in rivers elsewhere.

Q. Is it typical of this section of the river?

A. It is not typical of this section of New River. It is the unusual feature in this section of New River.

Q. Will you proceed to the next photograph?

A. The next picture was taken just below Klotz.

By the COURT. At what point is Klotz? I never heard of it.

A. Klotz is downstream, and across the river from Ripplemead. It is on the road between Ripplemead and Kimbleton.

Q. How far below Ripplemead?

A. I would think about a mile and a half or two miles.

By Mr. THOMPSON:

Q. Where is Klotz?

A. It is on the northeast side of New River downstream from Rippelmead, Virginia, a distance of one and a half to two miles on the road from Ripplemead to Kimbleton, Va.

2172 A. This picture was taken primarily to show what is meant by "entrenched valley or stream." That is, it shows that at one time that level at the top, not the mountain in the distance, but the level at the top, New River flowed over that level, and made it, and after this last large uprise New River was caught in that meander and has never since been able to get out of that channel. At a matter of fact those curves represent the position that New River attained at the time it flowed over the level referred to. In this picture you will notice, with the exception of the immediate foreground, that the stream occupies practically the entire width of the valley.

By Mr. JACKSON:

Q. How much higher was the old level, the extent of those uplifts you spoke about?

A. That is quite a story.

Q. Just briefly.

A. In the general area after the folding and faulting was planed down (after the folding and out faulting of that region under discussion), this is, it is assumed to have been plained down, with New River as one of the agents, then there was an uplift of the general area for probably hundreds of miles.

Q. To what extent in feet, can you say?

A. To a rise of approximately 1,000 or 1,400 feet, and then there was another period of quiescence. The New River and tributaries wore down again to a new level, and then another uprise for a distance of over 2000 feet, and now New River and its tributaries are cutting down through the second major uplift.

Q. Will you now describe what photograph #16 shows?

A. Photograph #16 was taken to show the condition of the rock underneath the surface at Ripplemead, Virginia, during or at the time of the construction of the new highway bridge at that

locality. In that particular area are limestones that are very soluble and this crane broke through a ledge of limestone and down into one of those sub-surface caverns.

2173 Q. No. 17.

A. No. 17 shows the rapids just below Berton, at Berton, Va., where again the resistant rock outcrops across the river almost at right angles to the general flow of the river. Notice in this picture that the dip of the stratum is very much steeper than the dip of the strata in the preceding photographs.

Q. In which direction?

A. It dips upstream.

Q. Now turn to No. 18.

A. No. 18 is the upper member of that rapids and it shows how the rocks outcrop in general across the river.

Q. You say the upper member——

A. The upper member of the rapids shown in the preceding picture.

The next picture shows the lower member of the rapids.

Q. Is that No. 19?

A. No. 19. You will notice in this photograph that the rock appears to be hollowed or moth-eaten, although these rocks are slightly soluble they are still resistant to the erosive forces of New River. This also shows the attitude or dip of the rock better than the preceding picture. That is upstream.

Q. Now No. 20.

A. Photograph No. 20 shows the outcrop forming a part further upstream of the rapids. This is at Berton, Va., and here again the rock strata trend across the river at right angles.

No. 21 shows a view of the falls and rapids above Berton, Va. In the distance is the gap between Gap Mountain and Walker's mountain. It is in that gap that the big falls are located.

No. 22 shows the big falls of New River in the gap, at the southernmost boundary line of Giles County, Virginia. The outcrops of the rock across the river show the very high inclination of the rock strata.

Q. You refer to the strata shown on the mountain side?

A. Yes, sir.

2174 No. 23 is a close up view of the big falls on New River at the Gap.

No. 24 shows the portion of the falls at the Gap, where you will see in the foreground of this picture that the water over at least a part of the outcrop falls perpendicular or vertical.

Q. You said a portion, which portion?

A. Near the right hand side, and also near the left hand side.

Q. Looking which way?

A. The observer's right hand side.

Q. I am talking about the picture, which way is it looking?

A. The observer is looking across and slightly upstream.

No. 25 is another view of the more westerly portion of the falls at the same locality. You will note in this picture that large boulders have been broken off from the outcrop and occur on the downstream side of these outcrops.

No. 26 was taken especially to show the relation of the river where it flows across a relatively nonresistant formation. Even here there are certain rock strata which are sufficiently resistant to form outcrops completely across the river, although at this place the river is somewhat widened.

Q. What are the nature of those rocks?

A. The nature of the rocks are somewhat resistant sandstone strata imbedded in shales.

Q. Proceed.

A. No. 27 is a view of New River which was taken near the mouth of Dry Branch, looking upstream from that point, toward Parrott, Virginia, in Pulaski County. You will note in this picture there are many falls and rapids along this section.

CROSS-EXAMINATION

Q. Mr. Mathews, what is your position at V. P. I. now?

A. I am instructor in the Department of Geology.

* * * * *

2175 Q. Now you spoke of this river being an unusual river in that it cuts across the mountain, that is the stratum or strata of mountain; am I correct in that?

A. I believe I said it was an unusual river because it cuts across where you have a concentration of steep strata where the beds dip in an upstream direction.

Q. That is not so unusual, is it?

A. Well, I tried to think of another river that did the same, but I do not know of any.

Q. How long were you in the State of Utah?

A. For the period that I mentioned.

Q. 15 years?

A. Thereabouts.

Q. You taught at the State University?

A. I did.

Q. Did you ever hear of the Dolores River?

A. I did, but I have never visited the Dolores River, neither did I have occasion to study the Dolores River.

Q. And you do not know that the Dolores River is known as the paradox river and is in the Paradox Valley, and the reason for it is that it cuts right straight across the mountain range, you don't know that, do you?

A. What is the dip of the bed of the Dolores River?

Q. I am not answering the questions; it is one of the interesting characteristics, is it not, of the State of Utah, geologically?

A. There are many interesting characteristics of the State of Utah.

Q. I am asking if that is not one of them?

A. I presume it is.

Q. That any geologist in the State of Utah ought to know about?

A. No, I would not say that.

Q. It is a fact, isn't it, that it cuts right straight through Sandstone?

2176 A. As I said before, I do not know the geology of the Dolores River.

Q. Now let's go over to this question of formation in this river. I believe you said there were certain strata that stuck up in the river and you said that some of them were—well, tell us again what different kinds of it there were—you said one was sandstone, am I correct in that?

A. Yes, sir.

Q. Dolomite?

A. And Limestone.

Q. And you said that they were very impervious to water, is that right, they would not wear down?

A. No, I do not mean to convey that at all. There are resistant members in sandstone formations; there are resistant members in limestone formation, and in dolomite formations. The chert beds are always resistant.

Now, just because the formation of the limestone is of limestone, that is no sign that it is resistant, and just because the formation is a dolomite, that is not a sign that it is, but there are certain members in dolomitic formations that would be more resistant than other members in the dolomitic formation.

Q. You did not say that in your examination in chief, did you?

A. No, but I am saying it now.

Q. You gave it unqualifiedly that one of them was limestone and they were very resistant, isn't that correct?

A. Well, I don't believe that I was asked that question, to distinguish between them.

Q. Didn't you say that there were ledges of limestone that was very resistant—you said they were very resistant, and used an illustration of something that might not wear down, did you not?

A. They are ledges.

Q. Well, as a matter of fact, isn't limestone solvent in water over a period of time?

2177 A. It is.

Q. And isn't it a fact that you find that limestone is much different from feldspar granite and substances of that kind, they are the ones that stand up against water?

A. That is not entirely true. If you will go along the northern Wasatch Mountains, above Brigham, Utah, you will find a series of limestone the are at least two to four thousand feet in thickness, one of the common ledge of nature is the Central Wasatch, and I think it shows very clearly in the City Creek Canyon at Salt Lake City. The Madison limestone is several hundred feet thick.

Q. The limestone outcropping here that you speak of is not any several hundred feet thick, is it?

A. Some of them are.

Q. None of them in this river—you do not mean to tell the court that there is any—I am speaking about outcrops?

A. The major——

Q. What is the width of the limestone and where was that found, the limestone down there, the width of the outcropping, that is going to be worn off by the water, is it not?

A. The depth of the Copper Ridge formation at Narrows is approximately 2,000 feet thick.

Q. That is true, but the outcropping, the particular part that is shown in these pictures here is not more than a foot or two wide, is it, that outcrop?

A. You mean a single bed?

Q. Yes, sir.

A. Oh, no, the single beds will vary from two inches up to four or five feet or probably even more than that.

Q. And it is your experience that one of the easiest rocks to leach out is lime, is that correct?

A. There are certain formations of limestone that leach rather rapidly, the formation from the vicinity of Newport over to the vicinity of Narrows is the Murphreesboro limestone.

2178 Now that is a very thin-bedded limestone, some of the beds not being over half an inch in thickness. It is a type of limestone that the water can circulate through readily and easily and therefore it is soluble.

Q. Yes, that is what I thought. I don't know the Town of Murphreesboro; can you give me more details about that?

A. That is not a town, that is a formation.

Q. Where is that located on the river?

A. I gave you the location, it is distributed over that area.

Q. So that the limestone outcropping that you speak of are known as the Murphreesboro limestone?

A. It is the limestone outcropping that I referred to in my testimony at Ripplemead Bridge, that is the Murphreesboro limestone.

Q. I understood you to say that that is not where it outcrops thick at all, is that right, at this bridge, or wherever you say?

A. No.

Q. As I understand you, it is not thick, that is correct, is it?

A. It is not a very thick formation.

Q. How old would you estimate in geological years this New River channel is?

A. Well, sir, if you will give me the basis for making that estimate, I will give you an approximate estimate of time in years.

Q. I am asking you now, because I am a seeker after light on this question.

A. It is better to refer to the age of a river in that respect in geologic terms rather than years.

Q. Now you said the tertiary, didn't you?

A. I did.

Q. And how many million years back is the tertiary?

A. That depends on the author of the estimate. It is variable from a few million years to possibly up to, I judge, fifty million.

2179 Q. So that New River was really flowing, you would say, two million years ago?

A. That is our geologic concept of New River.

Q. And the changes that come about in the flow of New River are almost imperceptible, aren't they?

A. Well, in terms of geology, a river like New River in a region like it flows through, from a geologic sense changes are very rapid.

Q. What do you mean by rapid?

A. I mean that because of the grade of the stream that the downcutting is very much more rapid, than laterally, that is you do not have a widening of the stream or of the stream channel, but you have a downcutting.

Q. Would there be a perceptible change for instance in the outcroppings which you have shown us in these pictures say in 200 years?

A. The probability is that there would be a perceptible change but it would depend on what limitation of perceptibility is indicated.

Q. Well, let's try to keep this in laymen's terms now. Would one of those outcroppings that you speak of, wear 3 inches in 100 years?

A. I doubt whether there is any definite rate ever been compiled on that factor.

Q. Speaking in terms of the life of a man, the wearing down is a very slow process, isn't it?

A. But relatively speaking, from a geologic standpoint, in a situation like New River, it is very rapid, it is just the same as Niagara Falls. Niagara Falls has been measured, but it is relatively rapid. I think it was only a year or two ago when a considerable ledge broke off there.

Q. That had been working on it for hundreds of years?

A. Yes, sir.

Q. And there was, of course, a very much higher water pressure than you have for New River, from the pictures shown?

A. That is a question of relativity that I am not qualified to answer.

2180 Q. In the next fifty years will there be any perceptible change in this compressed outcropping that you speak of out there near Glen Lyn, will there be, let us say, an inch worn off?

A. Well, I have no basis for thinking there would or there would not be.

Q. So you really don't know?

A. I really don't know how much would be worn off.

Q. Now there has been a channel, a thing that we call a channel so far as that river is concerned, if I understand you correctly, for many, many hundreds of years.

A. You used the word channel—the use of the word channel in my testimony refers to the width, or the entire width of the river.

Q. And you have said that you are not a hydrographer; do you know anything about channels?

A. No, from the standpoint you are referring to.

Q. I am referring now to the question of channel down the river, so that none of your testimony goes to the question of any channel down the river, does it?

A. Well, I could not truthfully answer that question yes or no, because I don't know what you mean by channel.

Q. I mean by channel, a place where the greatest flow of the water of the riverbed that you speak of concentrates and goes down?

A. Will you state the question again?

Q. Read the question to him. (Question read.) Do I make that intelligent?

A. You do not make it clear to me, sir.

Q. Let me see if I can do it better. In every river bed there is one place where the stream flow is more concentrated than in another part of that bed, speaking as to the relationship across the bed; that is true, isn't it? In other words, you never saw a river of the same depth all the way across, did you?

A. I would not say it did not exist, but the probability of its existence is slight.

2181 Q. You are not testifying here today about any channel in the stream?

A. I am not testifying about that particular depth that you are referring to now, is that it?

Q. Yes, that is right.

A. Will you state the question again.

Q. That concentration of water that comes down the bed of the stream, as I understand it, you are not testifying as to that particular phase?

A. That is right.

Q. You are only testifying as to the stream with respect to its entire width?

A. I am testifying to the physical condition of the river in reference to the geology of the region through which it flows.

Q. You said that there were four predominant breaks or faults in the river; now what were they?

A. I referred to the general geology of the entire region through which the river traverses, is that what you mean?

Q. Yes. As I understood you, those breaks or faults cross the river bed and there are four of them; what were they?

A. The names beginning from the northwest to the southeast——

Q. All right.

A. The St. Clair fault, the Narrows fault, the Saltville fault and the Pulaski fault.

Q. And those faults as I understand, were caused by an upheaval, were they not, from the center of the earth, in some way or another?

A. I think I testified that they were caused because of earth forces.

Q. In other words, the earth folding together and pushing up?

A. Pushing them up, it would be in a fold something like that [indicating].

Q. Do each of those faults occur only once in the river?

A. Those faults occur only once on the river in that area.

2182 Q. In other words, you are now talking just about this area?

A. From Belspring to Glen Lyn.

Q. So they only occur once each time, is that correct?
A. That is correct.
Q. Did you speak of a fault that you call the Narrows Fault?
A. I did.
Q. You are familiar with this map, are you not [Exhibiting map to witness]—Geological Map of the Appalachian Valley in Virginia?
A. I am.
Q. See if that Narrows fault does not appear twice?
A. It appears once.
Q. All right, come down here [indicating].
A. Oh, that is not in the New River section, this is way up to the southwest, this should be up here [indicating], that gives you the whole valley, clear across the state of Virginia.
Q. What does that line there mean?
A. That line means, H. H., that is drawn on the map to show the location of the section that this author has interpreted.
Q. Down in the lower right hand corner of this map—you have got your finger right there—do you see the St. Clair fault?
A. The St. Clair fault is right there.
Q. And then on down here is the Narrows 1, and Narrows two; doesn't that show that fault twice?
A. It does on that map, that is due to the fact——
Q. So you would change your testimony in that respect and way that the map shows the Narrows fault twice?
A. May I answer that this way?
Q. Oh, yes, go ahead and answer it.
A. On the west side of the river—southwest side of the river, the Narrows fault divides into two segments, or two faults, what we call a split fault. On this side it is only traceable in one—
some place between the west side of the river and the east
2183 side, these in two faults come together, don't you see, and that accounts for the statement.
Q. Now will you identify this map for us, Geological Map of the Appalachian Valley in Virginia, by Charles Butts, and he is the State Commissioner of Conservation.
A. Dr. Butts is a geologist of the State Geological Survey and was employed to do this survey—this geological survey work for the State of Virginia and the map was published, as I remember, in conjunction with the State Geological Survey, and the work of the Federal Government.
Q. This is an authoritative map, isn't it?
A. In a general way, yes.
Q. And accurate, too, you would say, isn't it?
A. Not in detail.

Q. It is not?

A. It is not.

Q. Geologists consider it inaccurate in this State?

A. That is right.

Q. Your own conf'rers would say that, would they?

A. They would. If you will bring the map over here, I will show you——

Q. You concede, as I understand you now, that so far as t river is concerned, this Narrows fault does appear twice, is that correct?

A. On the west side of the river, I have never been able to trace it across the river channel itself, and so far as I know, no one else has ever been able to do that. On the east side of the bank at that particular place you have the rock strata in general covered by gravel terrace.

Q. Doesn't this map show up here about a mile from the river, where this fault separates and goes across the river?

A. No, it is right on the river. He has drawn this wrongly in here. As a matter of fact, Dr. Butts says himself that this is wrong in here.

2184 Q. He does?

A. He does.

Q. So that you would say that if he was here to testify he would say that there is a mistake in this map with respect to that fault, wouldn't he?

A. I never like to testify to what another man will say in Court.

Q. You have heard him say that it was wrong then?

A. I have heard him say that it was wrong, and I pointed it out to him and called his attention to it and he admitted it was wrong at that time.

Q. Where is Dr. Butts?

A. In Washington—his residence is in Washington.

Q. What is he doing in Washington, where is he in case we should want to locate him?

A. I think his office is in the U. S. National Museum.

Q. Now how many of these outcroppings of strata did you say there were that you counted there between the Gap Mountain and Walker Mountain?

A. I did not make a count—I repeat it, it is in the record stated, in one point across the stream from Dry Branch it seems there are two different interpretations about Dry Branch, the stream is on the Southwest side——

Q. Help me out and show me where that is on here, will you? [Referring to map posted on easel.]

A. That ought to be in here some place [indicating].

Q. It would be downstream from Pepper's ferry?
A. Downstream from Belspring.
Q. And you were standing on the left hand side?
A. No, I was on the right hand side.
Q. And you were up on a hill, weren't you.
A. I was.
Q. And you were looking downstream, were you not?
2185 A. I was looking across, up and downstream.
Q. How many of these outcroppings did you say that you could see looking downstream?
A. I didn't count them looking downstream, I counted them as I could stand in one place looking upstream and downstream, and I counted 86.
Q. In what area were you looking? Approximately now, that is what distance?
A. Oh, I couldn't say.
Q. Give us your best estimate?
A. Well, it would be over a mile.
Q. Approximately a mile?
A. Well, it would be over a mile.
Q. Would it be over a mile and a quarter?
A. It might be, I dislike to say.
Q. You testified that you stood there and made that count, and I am just trying to get as nearly accurate as I can what you said; you counted 86; did you go down and inspect them down at close range?
A. No, I did not inspect all of them.
Q. How far apart were those outcroppings?
A. I mean to say, if I didn't say it, that I counted 86 riffles.
Q. Riffles?
A. Yes, sir.
Q. And you think that each riffle you see indicates one stratum, that is right?
A. Well, it might indicate more than one stratum.
Q. It might indicate more, but I am asking you does it always indicate any stratum?
A. It does not, because a row of boulders strung across the river will give you a riffle.
Q. So that you did not mean to testify here that there were 86 different strata outcroppings in that river bed, did you?
2186 A. I did not so testify.
Q. Well, I am glad to have you clear that up. In other words, a boulder may make a riffle, as you have said?
A. Well, a boulder would make a riffle locally, but not clear across the river channel—I mean clear across the width of the river, it would be just local.

Q. Did you afterwards, when the water was so low that you could get down there, and see where the riffles had been, did you go down there and count to find out how many strata outcroppings were there?

A. No; I did not.

Q. How far were you from the river when you made that count?

A. Well, I couldn't tell you that, but the river bank, and then the Virginian Railroad, and I was sitting here [indicating], not very many rods away from the stream.

Q. Were you a quarter of a mile, would you say?

A. Oh, less than that, I would judge.

Q. You really could not tell looking from where you were, whether it was an outcropping that was making that riffle or whether it was a series of boulders that might be across there, you couldn't tell from where you were, could you?

A. Well, I could not probably, but I have seen enough of those riffles in New River, in the section under discussion, to know that when a riffle goes clear across the stream, that usually—I presume 90 percent of them or more, are due to outcroppings of ledges of rock.

Q. Now let me get one further question; As I understand you, when this concentration due to these four faults brought those rocks together, or those outcroppings together, they were more or less crushed, were they not?

A. Rock strata in all high structural areas are broken more or less.

Q. So that there might have been a breaking up here of the outcroppings that would not necessarily indicate that each one of those outcroppings was a fault, isn't that right?

2187 A. What is that again?

Q. That each one of those outcroppings was a stratum, I should say?

A. Would you ask that again?

Q. Read him the question. [Question read.] In other words, when you have a coming together with a situation of that kind in geology, as you say, they break and fracture, don't they, the strata that are forced together?

A. Yes; they become fractured and then cement themselves together.

Q. And if they were in the river bed and water was flowing over them you could not tell how many strata were outcroppings in that particular section?

A. I merely referred to the riffles.

Q. Well, that is all right. I understood that your testimony was going to the thought that each one of those riffles was produced by an outcropping or by these strata which had been forced up, and if I am mistaken on that——

A. I do not think I so testified.

Q. All right. You took the photographs which you have exhibited here and I believe that you said you took these photographs in September, 1931?

A. Well, it was in the summer of 1931, the general time, the month is given under each one of those photographs.

Q. As a matter of fact, some of these photographs were taken in the winter time, weren't they?

A. I said in general they were taken—I don't say that they were all taken in——

Q. Some of them were taken in the winter time?

A. One or two.

Q. When you took these photographs, who did you take them for?

A. I took them for the Virginia Geological Survey, for a report for the Virginia Geological Survey.

2188 Q. Were you working for the Virginia Geological Survey?

A. Part of the time I was and part of the time I was not.

Q. When you took these pictures were you working for the Virginia Geological Survey?

A. Part of the time I was.

Q. Were you taking them under the orders of some superior to be used for some kind of report?

A. I received permission from the Virginia Geological Survey to present for this Court any pictures that were taken under their direction.

Q. I am not asking you that. I am asking you were these pictures all taken under your direction?

A. They were taken all by myself.

Q. They were all taken by yourself?

A. Yes, sir.

Q. And you were not employed by the Virginia Geological Survey, when you took the pictures, is that correct, or not?

A. A part of the time I was; some of these pictures were taken when I was not employed by them.

Q. Who were you employed by when you took those when you were not employed by the Virginia Geological Survey?

A. Well, when a man is doing commercial work there is a part of the time he is not employed.

Q. Were you employed at the time that you took these other pictures?

Mr. JACKSON. What do you mean by "other pictures"?

Mr. THOMPSON. He says that some of the pictures were taken when he was employed by the Virginia Geological Survey and he says that some of the pictures were taken when he was not employed by them.

A. I took at least one of the pictures in the group when I was not employed by them.

Q. Did you take more than one?

A. (Witness examines photograph album.)

2189 Q. Will you indicate those that were taken when you were not employed by the Virginia Geological Survey?

A. I am not certain whether 5, was taken—whether I was employed at that time or not, I don't remember.

Q. Well, how about three?

A. #3, yes.

Q. You were employed by the Virginia Geological Survey, weren't you, when you took that?

A. Yes, sir.

Q. Were you employed by the Virginia Geological Survey when you took #6?

A. Yes.

Q. And you will say the same about #8?

A. Yes.

Q. How about #10?

A. Yes.

Q. And #11?

A. Yes.

Q. All right. If you can tell us which ones that you were not employed by the Virginia Geological Survey, I wish you would do so.

A. #16, that seems to be the only one that I am positively sure of.

Q. That you did take when you were not employed by the Virginia Geological Survey?

A. Yes, sir.

Q. I say the ones you have named, only two of them, I believe, or was it one, only one that you did not take when you were employed by the Virginia Geological Survey?

A. I am not certain about #1.

Q. Now you say that you got authority from the Virginia Geological Survey to use any of these pictures in this case, is that right?

A. I did.

2190 Q. This album was prepared for the purposes of this law suit and these pictures gotten together for that purpose?

A. I had the pictures beforehand.

Q. You selected them for this case, didn't you?

A. I selected them to show conditions along New River.

Q. Are these all of the pictures you took in this particular area of New River?

A. No, sir. I don't know about the river. This in substance is a majority of the pictures I have taken along the river, but in that general area, I have taken a lot of pictures.

Q. You selected these particular ones for this case, did you?

A. I selected them.

Q. Out of all you had?

A. I intend to publish all or most of these pictures in my report to the Virginia Geological Survey.

Q. What kind of camera did you use?

A. An Eastman—I had two cameras.

Q. Did you just use a kodak?

A. I used what you call a Kodak.

Q. Did you have a lens in front of the Kodak?

A. Yes, sir part of the time.

Q. A lens that would magnify?

A. No, sir.

Q. Why did you have it there?

A. Because I used a tripod and put the camera equipped with a color filter on it in order to take the time exposures.

Q. You took these pictures strictly as a geologist.

A. I was——

Q. (Interrupting.) You wanted to show the outcropping of stratum and conditions on the river from a geological standpoint, as well as you could?

2191 A. Yes, sir.

Q. And you selected the driest part of the year for that purpose, didn't you?

A. When I was here in Virginia the first year, I did not know that I would be here very many months.

Q. When was that?

A. That was in 1931, when I was up here on the Geological Survey at their expense, and consequently, it was necessary for me to take the pictures at that time. It happened to be——

Q. Well, let me ask you——

A. It happened to be a time when the river was low.

Q. I am not saying that there was any coincidence about it, but you did take the pictures during one of the lowest flows known in this river, did you not?

A. I could not say about that, because I haven't looked up the flow of the river.

Q. You don't know anything about the flow of the river?

A. I have not looked up the details in time when the flow of the river was lowest, whether or not it was 1931 or 1932 or 1933, or 1929, or what it was. Now, undoubtedly, that data is published some place. I took the pictures because I was here—in 1931.

Q. Would these rocks have shown in high water?

A. Probably some of the ledges would not have shown—would not have even formed a ripple in high water.

Q. The same would be true if there was what we would call a medium flow of water in the river, wouldn't it?

A. Now, I dislike to answer that question, because I don't think that we have a meeting of minds.

Q. You are not sufficiently familiar with the river to state whether or not this was low water or a medium flow or not?

A. I considered this to be low water.

Q. But you were trying to take the pictures at a time when you could get these evidences of outcropping?

2192 A. That would be natural, yes, sir. As a geologist, a man would take the pictures when the situation he is looking for offers itself—he would naturally take the pictures then.

Q. Yes, sir, I want that for the record. You would not go there in high water, but at a time when you could see as many rocks as possible?

A. At this particular time I took the pictures because I happened to be in Virginia at that time doing work there at that time.

Q. And it was a coincidence that you happened to be there when it was low water?

A. I presume so.

Q. You said that you were brought into Virginia by somebody. Who brought you here?

A. I said the Geological Survey—Dr. Bevan.

Q. Did they send out to Utah and bring you here?

A. No, sir, I was at Oberlin, Ohio.

Q. He brought you here to do this work?

A. Yes, sir.

Q. And they sent you to take the pictures, did they?

A. He asked me to take as many pictures as I could of the area.

Q. Who asked you that?

A. Dr. Bevan, Geologist for the State of Virginia.

Q. You spoke about conditions in the river. Did you notice that on both sides of the river there were railroads?

A. Yes, sir, that is, through from Glen Lyn, I think, to Belspring.

Q. The Virginian comes on the right hand side, does it?

A. Yes, sir.

Q. And on the left the Norfolk and Western?

A. Yes, sir.

Q. And both of their right of ways are close to the river, aren't they?

A. Yes, sir—well, in a general way, they are close to the river, through a part of that area.

Q. In your geological studies, did you notice that they had blasted off much of the roadway or the trackage place for
2193 tracks and that it had fallen into the river?

A. They had blasted some in some of the localities.

Q. So there are rocks in the river that came from the roadways?

A. Yes, sir, but in the Gap at the falls in one picture, there are big boulders in the river a distance from the shore.

Q. Yes, they have been there for years?

A. Yes, sir; they have been there a long time.

Q. Now, will you give us in miles the area that your pictures covered with respect to the outcroppings?

A. I don't understand your question.

Q. Well, you have shown us here a series of pictures, I believe, twenty seven, or something more—isn't it a fact that, from picture No. 27—from 17 to 27, you cover a distance of about two miles on the river.

A. What was the first picture [witness refers to album]?

Q. From 17 to 27; it starts with the rapids of New River at Berton, Virginia, and it says the stream flows, and so forth.

A. I could not tell you the distance there, but that is a matter that can be scaled from any map. I never scaled it.

Q. You don't know the distance?

A. No, sir.

Q. But you would not say that it was over three miles, would you?

A. I would not say it was three miles or less than three; I don't know the distance.

Q. Look at the album again and refer to pictures 22 to 25, inclusive, and tell us if it is not a fact that these pictures are all of one rapids?

A. No. 22 is the picture of the Big Falls; 23 is a picture of the Big Falls closer up; No. 24 picture is the Big Falls showing a part; No. 25 is the same thing. I think I testified to that in the beginning.

Q. Isn't it a fact that this is the worst rapids in the river—I mean in the thirty-five mile stretch?

2194 A. I have not measured either the falls at the Narrows or the big falls at the Gap, and when it comes to comparisons between the falls, I must say that I don't know which would be the most hazardous of the two, which has the greater drop; in other words, I don't know. That would be a matter of engineering detail, which I should think could be obtained elsewhere.

Q. Did you, in your observation of the rapids in this particular stretch, find any rapids over which water was flowing or falling in the perpendicular?

A. Clear across the river or any part of the stretch?

Q. No, clear across the river, I would say?

A. I do not recall such, where the rapids—that is, the fall is vertical over the ledge completely across the river.

Q. Yes. As you say, when you were taking the pictures, you were taking them purely from a geological standpoint?

A. Yes, sir.

Q. And not as to the question of navigability?

A. No, sir, I was not interested in navigability at all, no, sir.

Q. And will you turn to the album at picture No. 2? You don't know whether a boat could go up or down that stretch or not, do you?

A. I do not.

Q. You don't know whether there is a channel there, if there is one, do you?

A. I do not.

Q. Will you say the same thing in regard to No. 3?

A. Yes, sir.

Q. Will you say that in regard to all the pictures?

A. I would, yes, sir.

Q. I notice a number of pictures here where you did not take the entire width of the stream?

A. I did that, merely to bring out certain features of the stream I wanted to discuss in my report.

Q. In picture No. 10, what you were trying to do was to bring out the rocks in as large relief as possible?

2195 A. That is right.

Q. And show the stratification?

A. Yes, sir; put in the strata.

Q. And you did not take the stream all the way across?

A. In order to get that picture, I had to go out on a boulder away from the southwest bank on the left side of the stream.

Q. And in order to take a picture of that kind, you took it as near—as close to it as you could, did you?

A. Yes, sir.

Q. And the same thing holds true of picture 11. In other words, it does not show all of the river?

A. No, sir.

Q. That is a close-up?

A. Yes, sir.

Q. And the same thing is true of picture No. 19?

A. I was standing right at the edge of the ledge, which is on the bank of the river.

Q. And you were as close to the rock as you could get to take the picture?

A. I had to be at least 15 feet away to get a picture like that (indicating).

REDIRECT EXAMINATION

Q. How far downstream, at what point down-stream, is the location of the picture in the album, Exhibit 549, which is the furtherest downstream?

A. The view or the location at which I took the picture?

Q. I mean the view—what point on the river is furtherest down the stream—the view that you show in the album as your picture No. 1.

A. Picture No. 1 itself.

Q. And these photographs in general relate to views further upstream from that point?

2196 A. Yes, sir.

Q. And how far upstream was the location of the last photograph upstream—what is it in your album?

A. In photograph No. 27?

Q. Where is it?

A. The smoke in the right hand side of the picture is the smoke, as I remember, from Parrott, in Pulaski County, Virginia.

By Mr. GATCHELL:

Q. What was that name?

A. Parrott.

By Mr. JACKSON:

Q. Where is it?

A. On the left side of the river.

Q. How many miles is that up the river from the scene of picture No. 1?

A. It is between Glen Lyn and Belstring—it is below Belspring.

Q. That is the range of the pictures—the range of the river covered by the pictures?

A. Yes, sir, they show from just below Glen Lyn, because it shows below there.

Q. You don't know how many miles that is?

A. Yes, sir, I judge it is practically thirty-five miles, the trip.

Q. You were asked whether or not the railroad at certain points had blasted cuts and some rocks from the blasting had fallen in the river. Please state whether or not the rocks and the rock conditions about which you testified on direct examination related at all or in any substantial degree to rocks which were thrown into the New River by railroad blasting or any other artificial cause?

A. I have not thought of that in just that sense; but as I recall them, most of the rock that was thrown over the bank of the river occurred at the place where the rock strata crossed the river and where the rock strata were very hard and resistant.

Q. What I want to know is this: when you testified
2197 about ledges and velocity of the riffles, you were testifying about rock—were you testifying about rock artificially thrown into the river or a natural formation or formations?

A. My intention was to testify to natural conditions in the river.

Q. Did your testimony relate to natural conditions?

A. It referred entirely to natural conditions, yes, sir.

RECROSS-EXAMINATION

Q. The 86 riffle that you spoke of, were they below McCoy's Ferry?

A. No, sir; a part of them were above McCoy's Ferry and part below.

Q. Was the place you described between that known as Sifford's Falls, where the riffles were?

A. I never heard of it.

Q. Do you know where Sifford's Falls are?

A. No, sir.

2198 HAROLD W. BUCK

DIRECT EXAMINATION

Q. Mr. Buck, what is your profession?

A. I am a consulting engineer.

Q. Tell us briefly something of the schooling you have had and what you have done.

A. I was graduated from the Yale Scientific School in 1894 with a Ph. B. degree; from the Columbia School of Mines in New York in 1895; with a degree of electrical engineer. In 1895 I became one of the engineers of the General Electric Company

in Schenectady where I remained until 1900. In 1900 I became a member of the engineering staff, as electrical engineer, with the Niagara Falls Power Company at New York and allied companies. I remained with them until 1908.

In 1908 I assisted in the formation of an engineering corporation called Veilie, Blackwell and Buck, which corporation has been engaged since its organization in the design and construction of various power plants in the United States, among which were the two hydro electric plants on New River of the Appalachian Electric Power Company and a steam plant at Glen Lyn, belonging to the Appalachian Electric Power Company.

In 1917 I was engaged by the War Department to make a report and recommendation as to the design and capacity of the power house to be constructed in connection with the Wilson Dam at Muscle Shoals; and on or about 1927 I was engaged by the War Department as a member of the Commission which made up the reports for President Hoover in connection with the navigation and power developments on the St. Lawrence River in New York and Canada.

Q. Mr. Buck, when did you first see New River?

A. Our attention was called, I think in 1909, to certain possible water power developments on the New River, lying between Ivanhoe and Fries.

Q. And that was the first section of the river you saw, was it?

2199 A. Yes, sir.

Q. Will you state what portions of the river you have observed?

A. We inspected the proposed water power possibilities between Ivanhoe and Fries and we saw that there were possibilities for development, but before engaging actively in construction, we examined all and every possible alternative locations for dams lying all the way from Fries down as far as Glen Lyn.

Q. Well, how did you make these observations and inspection trips?

A. The examination from Ivanhoe to Hiwassee was made partly on foot and partly by driving along the road and also from the railroad; from Hiwassee to Radford, the examination was made from a small flat bottomed boat; from Radford to Glen Lyn, the examination was made by driving down the wagon roads near the river and frequently walking to the river bank on foot.

Q. For how long a period of time did the inspection of that portion between Radford and Glen Lyn take place?

A. This part of the examination required about two months.

By Mr. THOMPSON:

Q. From Radford to Glen Lyn?

A. Yes, sir.

By Mr. FORBES:

Q. As I understand you, the only portion of the inspection trips and examination made by you by boat was in that stretch of the river between Hiwassee and Radford?

A. Between Hiwassee and Radford, and that was made after the construction had actually been initiated in the developments known as Byllesby and Buck, lying between Fries and Ivanhoe.

Q. Would you describe the boat that you used to make that trip?

A. This boat was one of the prevailing types of blunt-ended flat bottomed skiffs, about 12 feet long, and possibly three feet in width.

Q. What would its draught be?

A. The draught unloaded was about three inches and the draught, with three men in it, was possibly six inches.

Q. What was the stage of the river when you made this trip?

A. I had with me during the trip in 1910 the hydraulic
2200 engineer of the H. N. Byllesby Company, Mr. Link, and Mr. Wysor of Dublin, Virginia. We made some estimates and observations of the flow of the river and the cross-section from the surface, which we had at that time, and we estimated the flow to be in the neighborhood of 2,000 cubic feet per second, at the time we made the trip in the small boat.

Q. That was in what year you made the trip in the small boat?

A. Sometime in the summer of 1910.

Q. Will you describe the physical characteristics, so to speak, as you observed them, in making this boat trip?

A. We found what seemed to me very unusual characteristics, in that the river was—the floor of the river was made up of a succession of wide ridges of rock, extending down-stream, in some cases, for nearly a mile, over which the water flowed at rather high velocity, with a shallow depth, with intervening pools between these successive ridges or ledges of rock, and this condition existed all the way down the river from Hiwassee to Radford, ledges and ridges occupying a very considerable portion of the total distance traversed.

Q. Would you describe how you moved your boat along over that distance?

A. We rode part of the way where the depth of the water permitted. Over the shallow ridges and ledges, in many instances, we were unable to row, because the depth of the water

was not sufficient, and we used poles, and on frequent occasions, the skiff grounded on the underlying rock and we got out and waded and lifted the boat bodily down-stream, until the water was again deep enough for it to float with three men in it.

Q. Did you observe in most instances a concentration of water in what might be called a channel through these rock ledges or not?

A. The outstanding characteristic of New River is the fact that there is absolutely no channel in any part of the river that I have seen, the floor of the river being absolutely flat, almost as flat as a polo field, from one shore to another, without any evidence of the natural flow of the river having selected any particular spot for its concentration. It, therefore, made navigation and traversing it in a boat extremely difficult.

2201 Q. I assume you have outlined the difficulties that you had. Were there any other difficulties that you have not mentioned?

A. I might elaborate by saying that, as we passed into the intervening pools and approached one of these areas of shallow ledges, we would look downstream and try to pick out some section of the ledge which showed some advantage over another section in the depth of water, and it was impossible to make a selection of any particularly desirable route to follow.

Q. You said that you made observations on the river between Radford and Glen Lyn when you went down the river inspecting it. What were your observations of the physical characteristics of the river between those points—Radford and Glen Lyn?

A. We eliminated that portion of the river from consideration for power development, because we were unable to find a location where the construction of a dam would not seriously interfere with the Virginian and the Norfolk and Western Railroads, on each side of the river throughout that section. But we did observe that the physical characteristics of the floor of the river, all the way from Radford to Glen Lyn, were very similar to that which we had experienced between Hiwassee and Radford, except that they might be described as being even more so.

Q. First, what would you say as to the physical characteristics of the river above Hiwassee, in the part that you observed?

A. From Hiwassee to Fries, the same characteristics of outcropping ridges and ledges existed, the only difference being that the gradient of the river was somewhat steeper and the flow of water swifter, as I remember it.

Q. As you observed the river, what appeared to be the most important obstacle to the use of the river for transportation?

(Objection by Mr. Thompson.)

By Mr. FORBES:

Q. I will ask this: as you observed the river Mr. Buck, in proceeding over it in this row boat, what appeared to be the most important obstacle to the use of the river for transporting that boat?

A. The most serious obstacle to passage going down the river in that section were the frequently occurring out-crops of rock and the ledges across the river extending down-stream for distances, in some cases, up to nearly one thousand feet, and occurring every mile or two.

Q. You mean 1,000 feet measured up and down the stream?

A. Yes, sir.

2202 Q. And running across the stream?

A. Yes, sir.

Q. For how long a period would you say you have been familiar with New River?

A. From the time we made our first observation below Fries, in 1909, to the year 1927, when I terminated my connection with the Appalachian Electric Power Company. I believe I devoted throughout that period approximately one-third of my time to matters involving in some way the New River.

Q. Do you mean that that kept you within the vicinity of the river?

A. About one-third of my time was actually down along the river or on the river or near the river.

Q. Mr. Buck, will you state whether or not you have ever seen any farm or other products transported up and down that river in boats?

A. I have never seen, in all this contact with the river, any material transported up and down the river. I have seen wagons carried across the river on ferries, and I have seen small punts used by residents along the river for fishing local pools, but that is the only use of boats that I have seen on the river.

Q. You have described one trip you made from Hiwassee to Radford in this row boat. Did you make other trips from Hiwassee to Radford?

A. Our first trip from Hiwassee to Radford down the river was in 1910 and was for the purpose of making general observations of dam sites. In 1912 we made another trip throughout this district in a boat, largely for the purpose of locating sand deposits along the river for use in making concrete. In 1915 I made—I traversed down this section in a boat with a man who had done all our clearing in connection with transmission line construction, with the idea of estimating the amount of timber which would have to be cleared from the reservoir in connection with the so-called Number 6 development.

Q. Mr. Buck, will you state whether or not, in the construction of any dam on New River, you hauled anything by bateau?

A. When we were constructing the dams Byllesby and
203 Buck, we wanted very much to transport sand from an island down below the dams to the construction works by boat, and we looked into it very thoroughly and found the scheme was utterly impracticable, on account of the shallow water and the high velocity of flow.

Q. How far down was these points?

A. About four miles.

By Mr. THOMPSON:

Q. Below Hiwassee?

A. No; below the dam at Buck, which is the lower of the two dams constructed.

By Mr. FORBES:

Q. State what the stage of the river was, if you know, on the trip you said you made in 1912, from Hiwassee to Radford, and also what the stage was on the trip you made in 1915 from Hiwassee to Radford?

A. On the second and the third expeditions down the river in the boat, we made no specific measurements of the flow, but the general observations of the passage of the boat seemed to be, on both occasions, about the same as it was in 1910.

CROSS EXAMINATION

Q. Mr. Buck, I believe you said you became a member of the staff of the Niagara Power Company in 1908?

A. In 1900.

Q. Is there any relationship between the American Gas & Electric Company and the Niagara?

A. There is not, and never has been.

Q. Have you any stock in the American Gas & Electric Company?

A. I have not.

Q. Or bonds?

A. I have not.

Q. Have you any in the Appalachian Electric Power Company?

A. I have not.

Q. I believe you testified that you went up the river, or down the river, locating various power sites?

A. Yes.

204 Q. How many power sites did you locate?

A. I don't know in numbers, but New River is characteristic such that you can build a dam almost anywhere because

of these out-cropping rocks. Almost every place where there is a riffle, as they have been called, you can locate a dam, so there were a great many possible dam sites.

Q. As a matter of fact, I believe you did, from time to time, suggest or discuss the question of approximately six from Radford on up to Fries?

A. Six altogether, and later No. 5 was eliminated and consolidated with No. 6.

Q. To make the Radford project itself?

A. Yes.

Q. Then did you locate a dam site below Radford?

A. We investigated the possibilities of locating dams below Glen Lyn, but nothing between Radford and Glen Lyn, for the reasons I stated this morning, that the railroad prohibited such development.

Q. I thought at one time you did advocate the location of a dam between Hinton and Radford?

A. Hinton is below Glen Lyn. We did consider seriously one at Sandstone Falls, which is about 30 or 40 miles below Glen Lyn.

Q. That is 30 or 40 miles down-stream?

A. 30 or 40 miles below Glen Lyn.

Q. Did you consider a dam site at Hinton?

A. We considered in a very preliminary way the so-called Blue Stone location, and made a few rough surveys as a possibility.

Q. When you made these trips down the river, your chief purpose was, was it not, to locate sites?

A. We were looking to the future of the Appalachian Electric Power Company, and wanted to find practicable sites for future expansion.

Q. Did you, at that time, have any steam plant?

A. The Glen Lyn plant was in process of construction.

Q. Was that the only plant?

2205 A. That, plus the two water power developments which had been constructed up the river.

Q. Do you mean Buck and Byllesby?

A. Yes, and the switchback steam plant. Those were the principal sources.

Q. You are the one who really initiated what we will say in the Appalachian Electric Power Company?

A. I think I had a good deal to do with it.

Q. And it was your plan, was it not, to have a series of steam plants, and the peak load carried by the Buck and Byllesby and other hydraulic electric companies?

Mr. FORBES. That is objected to as improper cross-examination.

The COURT. Objection overruled.

Mr. FORBES. Exception.

A. We had no specific program for operation of the various plants. We knew that, on account of the fluctuating flow in New River, steam reserve was necessary, and we knew that any water power plant constructed would have to have steam auxiliary.

Q. Your plan was, was it not, to carry the base load on the steam plant and the hydro plant for the peak?

A. No.

Mr. FORBES. May we have it understood that we object to all this line of testimony in regard to the operation of the plant. In the first place, as I understand, Mr. Buck is talking about the Appalachian Power Company.

WITNESS. That is correct.

Mr. FORBES. And talking about a different company, and, furthermore, this is entirely outside of the scope of the direct examination.

The COURT. Your exception may be noted.

By the WITNESS. Our plan in general was to use the steam plant to supplement the flow in low water.

Q. But they were to be used for carrying the peak loads, were they not?

A. Not necessarily. That is still a debatable point.

Q. I didn't ask you whether it was a debatable point, or not, but your ideas.

A. Our ideas were not formulated at the time.

Q. When did you formulate your plans?

A. We have not formulated them yet.

Q. Do you recall writing a letter on October 19, 1925, signed by you for Viele, Blackwell & Buck, dated October 19, 1925, and on your letter paper, addressed to Mr. O. C. Merrill, Executive Secretary of the Federal Power Commission, in which you said, "At the present time, the Appalachian Electric Power Company has in operation near Ivanhoe a hydroelectric plant. The
2206 operation of this plant at times results in a variation in flow in the river from practically zero to 3,600 cubic feet per second." Do you recall writing that?

A. It is possible I did. I do not recall it.

Mr. FORBES. Your Honor, we object to it. It seems to me it is so outside of the scope of direct examination, it is not proper cross-examination, and has no bearing on the examination in chief, and we object to this line of testimony.

The COURT. Objection overruled.

Mr. FORBES. Note our exception.

By the WITNESS. I do not recollect the letter. It is quite possible I wrote it, and it is probable I did, if you have a copy of it.

Q. If you did write such a letter and set forth that the plant was run from zero to 3,600 cubic feet per second, would that indicate running on peak load?

A. Not necessarily peak load. It would indicate the flow was at peak at certain periods and was used to maximum capacity of the generators at other periods. That is all it indicates.

Q. Wouldn't that indicate you were, at certain times, using all the storage capacity?

A. It would indicate at that time that we were; yes. It is not an indication of policy, however.

Q. You used the word "we" when you were speaking a moment ago. You belong to this firm of Viele, Blackwell & Buck, do you not?

A. I did and do.

Q. Did you have authority to speak for the company?

A. I was, at that time, I think a director of the Appalachian Electric Power Company.

Q. So that when you——

Mr. FORBES (interposing). May we make it clear that this witness is speaking of the Appalachian Power Company, a distinct company from the Appalachian Electric Power Company, which is one of the parties to this suit, and that if Mr. Buck is to be the witness of the Government, and if this line of questions continues, plaintiff is bound by the answers.

The COURT. I don't know what distinction he is going to draw between the Appalachian Power Company and the Appalachian Electric Power Company.

Mr. FORBES. If your Honor please, one company bought out the other. The Appalachian Electric Power Company, as I understand, bought out the Appalachian Power Company—a distinct company. [The testimony was read.]

2207 Q. That is correct, is it?

A. Yes, "we" expresses the collective interest I had at that time.

Q. As the engineer, you were authorized to speak as the representative of the company, were you not?

A. No, I was not authorized to speak for the company. I was authorized to make investigations for the company and to obtain information.

Q. And when you wrote to the Power Commission, did you write as an individual, or were you writing on behalf of the company?

A. I was writing as the engineer of the company.

Q. Now, in this letter of October 19, 1925, you say, "In connection with the plan of New River Development Company to construct a dam and hydroelectric plant on New River, there are a few points I want to submit for your consideration." Were not you speaking for your company when you wrote that?

A. An engineer has no executive authority, but has authority to obtain information, and the authority implied in that letter is that of an engineer and not that of an executive.

Q. You were carrying out the instruction of your company, were you not?

A. General instructions to get information, yes.

Q. When you drafted the plans—you were the designer of Buck and Byllesby plants on New River, were you not?

A. Yes.

Q. When you designed those projects, you knew, before you started to operate, that is, you were the one who was relied on to set up a plant that was satisfactory, were you not?

A. The conditions when those two plants were started were entirely different. The load was very small and well within the minimum flow of the river, so the questions of carrying peak loads were not involved.

Q. Isn't it a fact, in that time, demand was increasing constantly for the use of electricity?

A. That is true.

Q. Wasn't it your purpose, in going up and down the river, to locate?

2208 A. It was, yes.

Q. These trips that you took down the river—did you enumerate all the trips that you took?

A. I do not believe it. There were so many, I couldn't possibly enumerate them.

Q. When you went down the river in this boat you spoke about, what was the length of that boat?

A. I think about 12 feet. It was the usual length of those boats along the river.

Q. How wide was it?

A. About three feet.

Q. And you say it drew about six inches?

A. I think so.

Q. You said from time to time you had to get out and push the boat, or pull it?

A. We did, and lifted it.

Q. You got down, though, didn't you, to your destination?

A. We did.

Q. And you did not do any portaging, did you?

A. We did, when we got to a ledge on which it was foundered.

Q. You are a sportsman, are you not?

A. Yes.

Q. You do not call that a portage?

A. No.

Q. Every time you went down the river you got to your destination, didn't you?

A. We did.

Q. You were the one that located the dam site at what is known as the Radford dam site, were you not?

A. Not the location now selected; no.

Q. You selected it down below, didn't you?

A. We selected it ten miles up above, and gradually moved it down until it is now near the location of others approxi-
2209 mately ten miles below where the original site which we selected was.

Q. Did you ever make any selection at the site of the ferry down below.

A. No.

Q. You did not?

A. We may have made some estimates on a possible dam. We considered every possible location there was.

Q. Why didn't they take your plan?

A. Because it was the desire that, as the company grew, to enlarge, and the site we selected above had a smaller capacity and smaller drainage area, and the dam has been moved down.

Q. Isn't it a fact you did not make any drilling at the site of the dam, so subsequent engineers came in and found it was not a proper site?

A. I do not concede that what we selected was an improper site, and I still maintain it was a perfectly good site.

Q. The company did not agree with you, did it?

A. No.

Q. That is the reason you resigned, isn't it?

A. One of the reasons, yes.

Q. Now, I believe you spoke about the river having a floor as level as a polo field?

A. A polo field is not a unit of measure, but I mentioned it as an expression of flatness.

Q. That is about as flat as anything you could get?

A. Yes.

Q. Would it be a difficult base or channel to run over in a boat?

A. Yes, with only a few inches of water over it.

Q. Suppose you had a few inches above the draw of your boat, wouldn't you get over all right?

A. Yes, if it were not roughened by these projecting pieces of rock which come up.

Q. As a matter of fact, these trips you took, you took in the summer time?

2210 A. Yes.

Q. Because you were not going to get out in cold water?

A. Yes.

Q. So you took it at a time when the water was at its lowest?

A. No; it was approximately 2,000 C. F. S.

Q. You would call that low water?

A. No.

Q. If there had been 4,000 second-feet flowing in that channel, the boat could have gotten over without having to get out and push it?

A. That is probable, although the increased swiftness of the water might have made some dangerous rapids for a small boat.

Q. When you got to investigating this situation way back there, did you read any records of engineers as to navigation on that river?

A. I knew in a general way that certain slots had been cut out of the rock.

Q. You knew, in coming down from Hiawassa to Radford, there was a channel?

A. I heard it, but I looked for it and couldn't find it. It was so distorted by debris I couldn't find it.

Q. You could see there was a channel there?

A. No; it was so full of that debris, it could not be utilized.

Q. That still would not distort the idea of a channel, would it?

A. No.

Q. So there could have been a channel there without your knowing about it?

A. A plugged up channel of very small proportions.

Q. Do you know what the Government proportions were?

A. No. I understood from hearsay it was designed to float logs through those slots.

Q. Do you know where Little River runs into New River?

A. I do.

Q. Did you ever know of any lumber being carried down the river on bateaux?

2211 A. I did not, and I testified this morning I had never seen any material transported on New River in the twenty odd years I have been connected with it.

Q. How many times would you say you had gone down New River and up from Hiawassa to Radford?

A. Three times.

Q. I thought you said a number of trips?

A. No; on foot on other trips.

Q. When you went down on foot, you did not go where you could observe the river, did you?

A. Yes. We drove down in an automobile, and then would go to the bank, and then go back and go to the river again.

Q. Was it pretty level along the bank?

A. No.

Q. You did not do much of that, did you?

A. Yes, I did a whole lot of it.

Q. Did you ever see any of the farmers out in boats doing anything other than fishing?

A. No.

Q. You never saw a boat go up the river or down the river?

A. I never did.

Q. Do you know that they have boats out in front of the cofferdam right now?

A. I don't doubt it.

Q. Motor boats?

A. That is quite possible. We had flat bottom boats in the construction at Buck and Byllesby, for the construction of cribs.

Q. You moved them about?

A. Yes, about fifty feet.

Q. Have you any reason to doubt that there were four or five thousand second-feet of water flowing from Hiawassa and that a boat might not come down there?

A. It might come down, but certainly not up.

2212 Q. Would you be surprised to know that men have gone up there in the last month in a motor boat?

A. I would be very much surprised.

Q. And it has been testified to in this room?

A. I don't know anything about it?

By the COURT. Has there been any testimony by anybody of going up there with three or four thousand feet? He said that he could not get up against that.

By MR. THOMPSON. That is correct. I am incorrect in my statement. It was less than that amount of water.

By Mr. THOMPSON:

Q. You say you spent about one-third of your time on New River from the time your firm was employed, I believe, to 1927?

A. I believe I said one-third of my time in connection with Appalachian Electric Power Company work. We built transmission lines and sub stations and steam plants and made investigations of all kinds.

Q. So you were really not on the river all the time, but going to the steam plants?

A. Yes, but the steam plant happened to be on the river.
Q. The transmission lines were not on the river, were they?
A. No, but they crossed the river at various points.
Q. Do you recall a hearing held before Major H. M. Trippe, on he diversion of New River to North Carolina, January 13, 1925, vhich you attended?
A. I don't remember the date. I remember protesting against he diversion of waters of the New River away from the dam of he Appalachian Power Company.
Q. Do you remember saying your company customarily used 98% of the entire flow of the river?
By Mr. FORBES. I would like to object to this question as not proper cross examination; in so far as the Government making this witness their own witness, they have already put on their case, and it seems to me under any theory it is inappropriate.
By the COURT. I think he is the Government's witness, but I don't see why he should not be examined because they have concluded their evidence.
By Mr. FORBES. Exception.
A. I think what I said in my letter is what I said.
Q. It wasn't a letter, it was a statement made at the hearing.
A. I think it was possible certain years we did use up to 98%, but that would not apply to particularly high years, when large floods would pass. I think there might have been years we did use 98%.
Q. I call your attention to a photostatic copy of that hearing, marked for identification Government Exhibit #247, and ask you if you made the following statement at that hearing:
"Judge ROBERT E. SCOTT. Mr. Buck, will you come around?
"Mr. H. W. BUCK. Mr. Chairman, I think some distinc-
213 tion should be made between the two divisions of the application of the Central Power Company insofar as those dams are involved which merely store the waters of New River without diverting it, as to which the Appalachian Power Company has no objection whatever. The more dams that can be built in New River above its present and future developments, the better it will be for the flow-maintenance and flow through the plants of the Appalachian Power Company. In regard to the diversion of waters from the proposed dam on the South Fork, however, there seems to be from certain statements which I have heard, some misconception as to the use of the waters made by the Appalachian Power Company.
"I have heard the statement made that the minimum flow would be maintained, and that the surplus flow would be that which would be appropriated for diversion. As a matter of fact, the Appalachian Power Company does not use the mini-

mum flow—it uses ten times the minimum flow, and its whole proposition is predicated upon such use of the water. The Appalachian system is a combination of steam and water power, and the hydroelectric plants so designed as to use ten times the minimum flow of the river, thereby generating an annual output in kilowatt hours which justifies their present development. The deficiencies between those excess flows is made up by the company's very large steam plant at Glen Lyn, so that the annual output is maintained as constant, with very large contribution of hydro-electric energy from its water power plants."

A. I did.

By Mr. FORBES. We object to that as an improper form of examination of your own witness, that really amounts to cross examination of one's own witness, and to read a statement like that to your own witness and ask if he made that statement is obviously leading and most objectionable.

By the COURT. Objection overruled.

By Mr. FORBES. Exception.

It was true then and it is true today, that statement.

Q. In your work as an engineer, Mr. Buck, and on the New River, did you give any value or credence to the Water Supply records of the Geological Survey?

A. We used them very largely, but we discounted them at times, because we checked them and found in many cases the readings had been made only once a month instead of every day.

Q. You depended on them when making your plans for the Buck and Byllesby dams?

2214 A. We used them in conjunction with observations we made.

Q. What observations?

A. We established gaging stations at various points along the river.

Q. Weren't they operated in connection with the Government's gaging stations?

A. They were not, but by men employed by ourselves for a period of sometimes a month at a time.

Q. Did you find any great divergence between yours and the Government's?

A. We did at times, and other times considerable agreement.

Q. As an expert engineer, do you think there is a better source than the Geological Survey gaging reports?

A. They are very helpful to all engineers.

Q. And the usual source of information?

A. They are, but as I said, they must be very carefully checked for the reason those local men employed to make the readings

every day often don't make readings more than once a month, they go off on a trip somewhere and come back and fill in.

Q That does not apply to automatic gages?

A. ..., sir; the more recent years automatic gages have been used, but at times they relied on the daily readings by the local residents.

Q. You do rely on the automatic gages?

A. Yes, sir.

Q. Are you familiar with what is known as the Hutton report, Government Exhibit #31, and which is a report attached to Major Craighill's report?

A. I don't recollect the Hutton report.

Q. The Hutton report was in 1872. Do you recall having ever gone over the outline he has given, description of the mile by mile conditions of navigation on the river?

A. I may have read it, but I don't recollect it.

Q. If that report indicates and shows that 85% of the stretch which you have been discussing was the channel, was in
2215 pools rather than in shallow places, would you agree to that?

A. No, I would not.

By Mr. Forbes. We object to that question. In the first place he is asking the witness to testify to a state of facts not shown to exist by that report, and further being his own witness he is attempting to cross examine him.

By the Court. Go ahead. I think the question might be asked in a different form.

By Mr. Forbes. Exception.

I think 15% is too small. The percentage of shallow water is much greater than 15%.

Q. Mr. Buck, it is a fact, is it not, that the Buck and Byllesby plant is operated so it goes from zero to 3600 second feet in discharge?

A. I have never had anything to do with the operation of either Byllesby or Buck. I have not been there for twelve years, and I cannot answer as to the present time.

Q. These trips you made down the river were they all before 1912?

A. 1910, 1912 and 1915, were the three times.

Q. If the Buck and Byllesby had been operating from zero to 3,600 second-feet in 1915, might that not have had some effect on the stream so far as navigation is concerned?

By Mr. Forbes. We object to that question, because predicated on facts not shown to exist and because cross examination of his own witness.

By the COURT. Overruled.

By Mr. FORBES. Exception.

A. I am very sure back in 1915 there was no such use of water at Byllesby as you mentioned. The load was not sufficiently high to make it necessary.

2216 R. J. HOLDEN

DIRECT EXAMINATION

Q. Mr. Holden, will you please state your name in full and your residence?

A. My name is R. J. Holden. I live at Blacksburg.

Q. What is your present occupation?

A. I teach Geology at the Virginia Polytechnic Institute.

Q. And where were you educated?

A. After preliminary schooling in High School and Academy I attended the University of Wisconsin, and received the degree of Bachelor of Science in 1900.

Q. Then what did you do?

A. Thereafter I taught Science in High School for two years. I returned to the University of Wisconsin and engaged in graduate study for a period of three years preparatory to the degree of Doctor of Philosophy. During the three years I completed all the requirements except thesis. In 1905 I was called to the Virginia Polytechnic Institute for two purposes; the main one of which was to study the iron ores of the State of Virginia for the Virginia Geological Survey. The other purpose was to teach Geology in the Virginia Polytechnic Institute. At odd times, when occasion permitted, I continued the work on my thesis. As an undergraduate I took all of the work in history which was offered for undergraduates in that institution.

Q. Mr. Holden, you referred to your thesis, in connection with your Doctor's degree, what was the subject of your thesis?

A. A history of the iron ore industry in the United States.

Q. Did you complete that thesis and receive your Doctor's degree?

A. I completed that and received my Doctor's degree in 1915.

Q. Are you a member of any scientific or professional society?

A. Yes, both. In the matter of scientific societies, I am a fellow of the Geological Society of America, and American Association for the Advancement of Science. In the matter of

2217 professional societies, I am a member of the Society of Economic Geologists; the American Association of Petroleum Geologists; the Society of Economic Paleontologists, and the American Institute of Mining Engineers.

Q. Have you written and published any papers on scientific or echnical subjects?

A. I have published various articles along scientific and pro-essional lines, among these articles there are items in the pub-cations of the U. S. Geological Survey, of the Virginia Geo-ogical Survey, of the Bulletin of the Geological Society of merica, and the magazine known as Economic Geology, in the ransactions of the American Institute of Mining Engineers, in he magazine known as Science, in the publications of the Inter-ational Geological Congress, and the magazine Journal of eology.

Q. Do you own any stock in the Appalachian Electric Power ompany?

A. I own ten shares of preferred stock.

Q. Have you ever been employed by the Appalachian Electric ower Company?

A. I was employed by the firm of Viele, Blackwell and Buck, n connection with some geological work, in connection with the roposed Radford dam development.

Q. Since you received your Doctor's degree in 1915, what has een your occupation?

A. I have been teaching in the Virginia Polytechnic Institute, orking for the Virginia Geological Survey, and doing work or various private concerns.

Q. Do you specialize within the broad field of geology?

A. Yes, my specialty is economic geology.

Q. You referred to the fact your thesis, for your Doctor's de-ree, had dealt with the history of the iron ore industry of the nited States; state whether you studied the history of the iron ndustry of Southwestern Virginia, after, or before you came to irginia Polytechnic Institute?

A. I tried to study it from a distance, in Wisconsin, but there ere many things I could not understand, and it was with con-derable eagerness I embraced the opportunity to study first hand the industry in Southwest Virginia.

218 Q. You spoke a moment ago of your specialty being within the broad field of geology, economic geology; will ou tell the Court in a word what that is?

A. Economic Geology is a rather broad term, and it includes he study of ore deposits, non-metallic deposits, the water re-ources, and almost everything in geology that has commercial pplication.

Q. You referred to making a study of the iron industry of outhwestern Virginia. State if that study had any connection ith the Geological Survey of Virginia?

A. It was done under the direction of the Geological Survey of Virginia.

Q. Have you made any study of the lead and zinc industries of Southwestern Virginia?

A. Yes. The lead and zinc occurrence is very closely associated with the occurrence of iron, and it is impossible to study the iron ores of that region without having intimate contact with the zinc occurrences, the mining utilization of the zinc materials. As a matter of fact, the iron ore, lead ore and zinc ore have been mined from the same mine.

Q. Have you done any work in your profession for private clients?

A. Yes, for a great many, and in rather diverse lines, in iron ore, lead and zinc, and limestone work, for a variety of interests.

Q. You refer to your private work or work for private clients having to do with iron, lead and zinc ores, did it have anything to do with those industries in Southwestern Virginia?

A. Yes.

Q. Did your study of the iron, lead and zinc industries include or have anything to do with the history of those industries in the upper New River valley?

A. Yes, quite decidedly. I was thinking perhaps I didn't answer the previous question fully. I have done considerable work in zinc in Tennessee, and the usefulness of my work in Tennessee was based to no small extent on my knowledge that has been gained through many years of the study of similar ores in Virginia. As a matter of fact, I did considerable work for one client in the Ivanhoe region.

2219 Q. Dr. Holden, what, in general, were the mineral resources of the valley of New River?

A. Iron ore in various forms, lead and zinc, some sulphide iron ores that have been used in the manufacture of sulphuric acid at Pulaski, some coal resources, and various other things.

Q. How did the iron ore deposits of Southwestern Virginia compare with other known deposits of such ore in Virginia, say prior to 1888—what was the relative magnitude so far as they were known prior to 1888, compared to known iron ore elsewhere in Virginia?

A. They were conspicuous. They were deposits of a character that were readily seen and they had attracted attention from the earliest time.

Q. Were they larger or smaller than other known deposits at that time in Virginia?

A. I think they were considered larger.

Q. You have stated you have made a study of the iron, lead and zinc industries of Southwestern Virginia. Will you please state something of the sources which you examined and studied in the course of your study of these industries in that area?

A. You mean from a historical standpoint?

Q. Yes.

A. I studied everything I could find.

Q. Will you just give the Court some idea what those historical sources were?

A. The one that interested me most was perhaps Iron Manufacturers' Guide, written by J. P. Leslie, and published in 1858; another one was Iron in all Ages, by J. M. Swank, and published about 1892; another one was the Bishop history of American Manufacturers; another was various items in the Transactions of the American Institute of Mining Engineers; the records of production of the U. S. Geological Survey, as published in Mineral Resources; a private report on the history of the zinc mines at Austinville; Bulletin #43 of the Virginia Geological Survey; publication known as the Mineral Resources of Virginia; C. R. Boyd's Mineral Resources of Southwest Virginia; reprint
2220 of the annual reports of the State Geologist, W. B. Rogers; publication prepared for the Norfolk & Western Railway by McCreath and D-Invilliers.

By Mr. THOMPSON:

Q. Is that a publication in the libraries so one can get it?

A. Generally. [Continuing.] On account of my interest in the historical side of this matter I interviewed all of the men who are engaged in the industry, at an early date, particularly the older men. I have talked with Mr. D'Invilliers, perhaps the most interesting was John W. Robinson and C. S. Lucas of the Pulaski Iron Company, Mine Superintendent, and Mr. A. J. Dull, President of the Pulaski Iron Company.

Q. Mr. Holden, when did you commence your research into these histories in Southwest Virginia?

A. Do you mean before or after I came here?

Q. Or at whatever time it was.

A. I began several years before I came here.

Q. Did you continue after you came here?

A. On every occasion and from every source.

Q. You have referred to a number of written documents and reports as among sources you have examined in the course of your studies. Will you please state whether those documents are generally accepted by students of the history of those industries in this area as reliable or trustworthy?

A. These reports are considered authoritative. In history we must draw from all available sources and as historians we must judge as to the relative value of the things. I consider all of these things I have cited as important and reliable.

Q. Doctor, prior to the time in 1886 when the Cripple Creek Division of the Norfolk & Western Railway Company was put in operation from Pulaski up as far as Foster Falls, what, if any, iron, lead or zinc industries were located on or near New River above Radford?

A. I am not familiar with all the zinc operations. The chief zinc operation wa the mine now operated at Austinsville. There were a couple of other operations, one of which I think is called the Bertha Mine and was operated as a zinc mine for some
2221 years before I came to this country. At that time when I first visited the region it was being operated as an iron mine and some zinc recovered as a side issue. There were a considerable number of charcoal furnaces—did you say before 1888?

Q. Before 18—in and prior to 1886, when the Cripple Creek Division of the Norfolk & Western was built from Pulaski to Foster Falls?

A. I must answer that from the records, because I was not there at that time, but there are abundant records to show that there were many charcoal furnaces operated in that region.

By Mr. JACKSON. I produce a map which bears the legend in the upper left-hand corner "Geological Map of the New River, Cripple Creek Region, showing the approximate location of ore openings and properties tributary to the Cripple Creek Extension of the Norfolk & Western Railroad, by E. V. D'Invilliers, Geologist, 1887," and ask to have it marked as Defendant's Exhibit 550, for identification.

(Same is here marked for identification as requested.)

By Mr. JACKSON:

Q. Dr. Holden, I show you defendant's Exhibit 550 for identification, and ask you what it is?

A. This is a map which accompanied the report of McCreath and D'Invilliers, a report being made to the Norfolk & Western Railway Company.

Q. Does that map purport to show the location of iron, lead and zinc mines and of iron furnaces and lead and zinc industries in that area?

A. It does.

Q. Doctor, please state what reputation this map bears among tudents of the iron, lead, and zinc industries of southwestern Virginia as to accuracy of the locations of the various mines and urnaces shown thereon?

A. The map is generally accepted by students of iron, lead, and inc industries of southwestern Virginia as correctly showing he locations of the iron and zinc industries in that region. My wn study confirms the general acceptance—the general correctess of this map.

Q. That is in that respect?

A. In that respect. As a matter of fact, it was the chief guide hat I had when I started to study this region and I was quite ritical in regard to it, but I was unable to find anything essenially incorrect on it.

(Exhibit 550 introduced in evidence and subsequently phototatic copy thereof was substituted for said exhibit.)

Q. Dr. Holden, when were the charcoal and iron furnaces esablished which are shown on Defendant's Exhibit 550 as having een situated on or within easy access to New River?

A. All the furnaces mentioned in the category are not shown on that map.

222 Q. Will you state the date of the establishment of the early charcoal-iron furnaces with which you have become amiliar during your study of this subject?

A. I have here a list of such furnaces, together with the date f building, the date of rebuilding, and as a matter of convenince, I will hand this to the reporter.

Q. Will you read it so it can be heard and then you can give t to the reporter for copying, so it will be easier for the reporter.

By Mr. THOMPSON:

Q. Are there many of them?

A. A dozen or so. I have not an extra copy here, but I can urnish one.

By Mr. JACKSON:

Q. Will you read that, doctor?

A. The first column is name of the furnace, the second olumn is the name and building date and the third column is the late of rebuilding:

TABLE A

(List of certain Charcoal Blast Furnaces of the New River Region of Southwest Virginia with dates of Construction)

	Original building date	Rebuilt
Poplar Camp	1788	
Cedar Run (Parry Mount No. 1)	1800	
Raven Cliff	1810	1876
Brown Hill (Wilkenson's)	1810	1870–4, 1882
Little Wythe	1819	1876
Cedar Run (Parry Mount No. 2 or Graham's)	1832	
Barren Springs (Graham's New)	1853	1873
Eagle (Gray Eagle)	1864	1881
Radford (Macks Creek)	1868	
Walton	1872	1882
Speedwell	1873–4	
White Rock (Panic)	1875	
Beverly	1880	
Irondale (Norma or Noble)	1881	
2223 New River (Foster Falls or Pierce)	1881	
Reed Island (Boom)	1881	
Cave Hill	1881	
Ivanhoe	1881–2	
Sinking Creek	1873	

Q. Dr. Holden, will you state the capacity of these charcoal pig-iron furnaces for which reliable data are available?

A. I have that written out on a sheet, and I will read it: "Raven Cliff furnace had a daily capacity of ten tons. Brown Hill and Walton Furnaces an annual capacity of 8,500 tons——"

Q. That is for both of them?

A. I understand that that is the combined production capacity of both furnaces, and so given because they were owned by one concern.

By Mr. THOMPSON:

Q. May I ask where you got those figures from? You say you understand that the combined capacity there—where did you get these figures from?

A. Mostly from various sources, partly from an Iron Manufacturers Guide, partly from the Virginias.

Q. Virginias what?

A. Virginias is the name of a magazine which was published from 1880 to 1885, by Jed Hotchkiss, at Staunton, Virginia. Also these capacities were taken from the bulletins of the American Iron and Steel Association. In case of discrepancies I have used the information which seemed to be the most correct. In addition to this, I can say that I have seen most of these furnaces personally and am able to judge something from my own observation.

By Mr. JACKSON:

Q. Will you proceed with your reading?

A. "Wythe Furnace an annual capacity of 1,500 tons. Cedar Run (No. 2) an estimated annual capacity of 2,000 tons. Eagle, an annual capacity of 600 tons. Radford furnace an estimated annual capacity of 4,000 tons. White Rock, a daily capacity of 8 tons. Beverly, Eagle, Raven Cliff and Speedwell, an
2224 annual capacity of 7,500 tons. Irondale, an estimated annual capacity of 3,000 tons (daily capacity 15 tons). New River, an annual capacity of 2,000 tons. Reed Island, an annual capacity of 2,000 tons. Cave Hill, an estimated annual capacity of 2,500 tons. Ivanhoe, an annual capacity of 8,000 tons. The foregoing tonnages are based upon the short ton figure of 2,000 lbs. to the ton."

Q. Dr. Holden, what was the annual production in 1880 of these charcoal iron furnaces for which production figures are available?

A. I have here a table which I have prepared, giving such production.

Q. Production for 1880?

A. For 1880.

Q. Will you read it, please?

A. This is also in tons of 2,000 lbs. "Radford, 930 tons." Boom was then in process of building——

By Mr. THOMPSON:

Q. Where did you get your items for the Radford furnace of 930 tons?

A. From the Virginias, Volume 2, page 29, for the year 1881, Volume 2, page 29.

Q. May I ask what the Virginias is?

A. The Virginias is a magazine which was published monthly throughout the years 1880 to 1885. It is a standard source of information along lines of natural resources for those dates.

Q. Well, who is the authority for the publication?

A. I gave that previously—Jed Hotchkiss.

Q. Who is he?

A. I was not personally acquainted with Mr. Hotchkiss, but he was a man of considerable geological training and deeply interested in mineral resources.

Q. Was he a man of outstanding figure in the geological world?

A. He was an outstanding figure in Virginia at that time, he was preeminent.

By Mr. JACKSON:

2225 Q. Was Mr. Hotchkiss an engineer for a division, or part of the army commanded by Stonewall Jackson, do you know?

A. I am not quite sure, but I think he held some such position.

Q. Was he a man of any reputation for veracity or probity?

By Mr. THOMPSON. If Your Honor please he might have a reputation for veracity——

By the COURT. If you will permit an interjection by the Court here, he was a very notable figure following the Civil War and some years thereafter. He was an engineer and geologist and very much interested in mineral resources in the State of Virginia and in a general engineering and mining development—not only a geologist of considerable note but also an engineer, and he published this magazine to which reference has been made, for the purpose of furnishing information and giving data and arousing interest in the mineral resources of Virginia and to keep people informed about them. He was a very prominent figure in the State for many years. I know that was his history and status in the history of Virginia.

By Mr. JACKSON:

Q. This magazine, the Virginias, what was its reputation among students in this field, as to reliability and trustworthiness?

A. I have considered it a chief source of historical information for these things that I am particularly interested in and I have never heard any question of essential facts raised.

Q. Will you proceed?

A. What was the question?

Q. The question is, I ask you to read into the record the table which you had prepared showing the production for 1880, of such of these charcoal-iron furnaces as there is reliable data for?

A. I had started on that—I will begin at the beginning: "Radford, 930 tons; Boom, Building; Barren Springs, 1,500 (about); Cedar Run, 1,000; Pierce, Building; Walton, 350–400; Brown Hill, 1,000; Raven Cliff, 1,500; Beverly, 650; Wythe, 1,650; Speedwell, 750."

Q. Doctor Holden, have you prepared a table of the annual production in 1881 of these charcoal-iron furnaces for which production figures are available?

A. I have.

Q. And were those figures obtained from the same sources as production figures for 1880?

A. They were obtained from the Virginias, Volume 3, page 52, for the year 1882.

2226 By Mr. THOMPSON. You are referring now to this Table B-1 that we have?

By Mr. JACKSON. No, it is the table the doctor has marked "C."

A. I have previously given you the reference to B-1.

Q. Now if you will please read——

A. Again in tons of 2,000 lbs.: "Beverly Furnace, 950 tons; Cedar Run, 1,250; Eagle, 600; Irondale, 700; New River, 980; Raven Cliff, 1,500; Reed Island (Boom), 1,125; Speedwell, 600; Walton, 800; White Rock, 725; Wythe, 850."

Q. Dr. Holden, have you prepared a table showing the annual production in 1882 of the Charcoal Iron furnaces for which production figures are available?

A. I have.

Q. And did you obtain that information from substantially the same sources as the information for 1881?

A. From Virginias, Volume 4, page 5, for 1883.

Q. Will you read that?

A. Again in tons of 2,000 lbs.: "Barren Springs, 500 tons; Beverly, 1,600; Brown Hill, 1,000; Cave Hill, 450; Cedar
2227 Run, 900; Eagle, 350; Irondale, 1,200; Ivanhoe, 2,100; New River, 2,100; Macks Creek (Radford), 950; Raven Cliff, 1,500; Reed Island (Boom), 2,100; Speedwell, 1,200; Walton, 1,300; White Rock, 1,200; Wythe, 750."

Q. Dr. Holden, what was the total production of these charcoal iron furnaces for 1882?

A. About 20,000 tons.

Q. Are there production records showing separately the production of such charcoal iron furnaces for the period 1883 to 1886?

A. I have not been able to find any records stating separately the production of charcoal iron furnaces after these years.

Q. State if you know whether there was production from charcoal iron furnaces on or near New River, above Radford, prior to and subsequent to the years for which you have given production figures, that is, 1880, 1881 and 1882?

A. Will you repeat that please.

Q. Read him the question. [Question read.]

A. Yes, there was production both before and after those years.

Q. During the period prior to 1887, what proportion of the production of charcoal pig iron in Virginia was produced by the furnaces on and along upper New River?

A. During the period prior to 1887 most of the charcoal pig iron produced in Virginia came from the upper New River. For 1882 the charcoal iron produced in upper New River furnaces was

approximately 19,200 tons. The total production of charcoal iron in Virginia for 1882 is reported as 26,133 tons. The furnaces along New River contributed about three-fourths of Virginia's production of charcoal iron in that year.

Q. Doctor, have you prepared a table showing the annual production of charcoal pig iron in Virginia for the period from 1872 to 1884 inclusive?

2228 A. I have.

Q. Will you read that into the record please.

A. "1872, 21,445 tons; 1873, 22,475; 1874, 23,451; 1875, 15,391; 1876, 7,350; 1877, 6,193; 1878, 6,333; 1879, 7,703; 1880, 14,043; 1881, 19,038; 1882, 26,133; 1883, 16,879; 1884, 14,829."

Q. Have you also prepared a table showing the annual production of pig iron in Virginia, both charcoal and coke for the period of 1872 to 1880, inclusive?

A. I have.

Q. Will you read that into the record please.

A. "1872, 21,445 tons; 1873, 26,475; 1874, 29,451, 1875, 29,985; 1876, 15,046; 1877, 12,434; 1878, 16,928; 1879, 18,873; 1880, 29,934; 1881, 83,711; 1882, 87,731; 1883, 152,907; 1884, 2229 157,843; 1885, 163,782; 1886, 156,250; 1887, 175,715; 1888, 197,598."

Q. Dr. Holden, your table on the charcoal pig iron production in Virginia 1872 to 1884, inclusive, were there any records later than 1884 showing the charcoal pig iron production separately?

A. I was able to find none.

Q. I think you have already testified as to the lead and zinc industries on or near New River, above Radford, in and prior to 1886, have you not?

A. As to the history?

Q. No; as to whether there were any or not?

A. Iron and zinc?

Q. No; lead and zinc.

A. I don't remember.

Q. Well, were there any before 1886 on New River above Radford?

A. Yes, sir.

Q. Give very briefly what they were?

A. The mining and smelting of lead and zinc had been carried on on the upper New River beginning about 1750, and is more or less continuous since that time. The zinc industry in the upper New River commenced operation near Austinville in 1864, and has operated quite continuously since that time.

Q. Dr. Holden, will you state what historical sources you have examined or considered in connection with the question of what route and means of transportation were employed by these char-

coal iron furnaces and lead and zinc industries on or near New River at and prior to 1886 when the Cripple Creek Railroad was built up to Foster Falls?

A. Well, a gentleman of some reputation, and once President of the United States, Thomas Jefferson's Notes on Virginia, and another source is the U. S. Engineers Reports. I think also there is considerable information in various volumes of the Virginias.

By Mr. THOMPSON:

Q. What did you consult?

A. I consulted Thomas Jefferson's Notes on Virginia, I
2230 consulted the U. S. Engineers Reports, I consulted the Virginias, and furthermore I have talked with the old residents in this region.

By Mr. JACKSON:

Q. Have you consulted any other works upon the mineral resources of that region or of Virginia?

A. I have consulted everything that I could find.

Q. Did you examine the works of C. R. Boyd, entitled "Resources of Southwestern Virginia, showing the mineral deposits etc., and methods of transportation etc."

By the COURT. Did you consult that particular book?

A. I did.

By Mr. JACKSON:

Q. Is that book regarded as authoritative or not by historians or investigators in your field?

A. It is. I consulted also a reprint of the Geology of the State of Virginia by the State Geologist, W. B. Rogers.

Q. And how is that works regarded among students in this field?

A. As an official publication.

Q. Doctor, prior to the opening of the Cripple Creek Division of the Norfolk & Western Railroad between Pulaski and Foster Falls in 1886, what does your historical investigation disclose to have been the route and means of transportation to and from these charcoal iron furnaces and the lead and zinc industries on or within convenient access to upper New River?

By Mr. THOMPSON. Your Honor, we object to that on the same grounds that we have been objecting right along. He has been referring to this magazine called the Virginias, and we have got these four volumes of it and I note that these articles in here are not written by this Jed Hotchkiss—he is the editor of the magazine, and here, for example, it says "We are indebted to our well-informed friend and correspondent, John W. Robinson, Esq., of Graham's Ford, Wythe County, Virginia, for the

information under date of December 28, 1882, from which we have prepared the following full and accurate account of the operations during the year 1882, of the group of 16 charcoal iron blast furnaces located in the Valley on New River and its branches in Smith, Wythe and Pulaski Counties, Virginia, and known as the Southwest Virginia blast furnaces." And
2231 then he goes on to say: "In transmitting this data, Mr. Robinson writes: 'I am sorry to say that the outlook for 1883 is not very encouraging for the iron producers. The low price of iron and the high price of labor, supplies, etc., together with our remoteness from railroads, will deter the most of us from operating our furnaces until things are better. There are no new enterprises on hand and there will be none until we can get cheap fuel.'"

Now here is a newspaper reporting on the situation in the iron industry up there. We are not impeaching this man who is the editor of this magazine, but he was getting his information from some correspondent.

By the COURT. In any magazine there is matter written by correspondents. Take any ordinary trade magazine, it will undertake to give you the extent or the status or business conditions throughout the United States, and that is gathered from their correspondents.

By Mr. JACKSON:

Q. Just in brief, who was John W. Robinson?

A. John W. Robinson, I was acquainted with personally. At the time I knew him he was a Field Superintendent of Iron Mines for the Virginia Iron, Coal & Coke Company. At the time the Virginia Iron, Coal & Coke Company was formed, it was formed to no small extent around a nucleus of furnaces in which John W. Robinson was interested. John W. Robinson, if I remember correctly, married into the Graham family. The Graham family had been interested in using charcoal pig iron from 1800 to the time of the formation of the Virginia Iron, Coal & Coke Company.

Q. In this southwest Virginia field?

A. Yes, sir.

Q. And do you know whether he was connected with some of these furnaces you have named—charcoal iron furnaces?

A. He was the leading spirit in the iron industry in southwest Virginia and at times he was financially interested in several of them, and I think at times four or five.

Q. Can you name them?

2232 A. He was interested in the Barren Springs furnace. I think he owned the Barren Springs furnace, but off-hand,

could not state definitely the furnaces in which he was interted, but they were in that list that I read, if I may go back to e list, I think I can indicate the furnaces which I think he was terested in.

By the COURT. I don't think that is necessary.

Q. Doctor, now I will ask my questions: Prior to the opening the Cripple Creek Division of the Norfolk & Western Railad between Pulaski and Foster Falls in 1886, what does your storical research disclose to have been the route and means of ansportation to and from these charcoal iron furnaces and the ad and zinc industries on or within convenient access to New iver?

A. The history of these industries shows that the method of ansportation to and from the charcoal iron furnaces was by agon over wagon road to rail heads. In the very early days ansportation was overland to points further east in Virginia d elsewhere. It is true that some of the reports of the Chief Engineers of the United States Army show that some iron om Radford and Boom furnaces was boated down to New iver bridge about 1881 or 1882, the iron boated down New River New River Bridge, from Radford and Boom Furnaces during ose years did not include all the production of those furnaces, d represented only a small fraction of the iron production of e furnaces located on and within convenient access to New iver.

By Mr. THOMPSON:

Q. Are you reading from a book or is this your own view?

A. It is my own view.

I have not finished.

By Mr. JACKSON:

Q. All right, continue.

A. (Continuing.) There is no evidence in historical records of ating from Radford and Boom Furnace—that it continued ter 1882 or 1883.

Q. Will you state, if you know, Doctor, whether or not any rt of the products of these charcoal pig iron furnaces of upper ew River, was marketed in Cincinnati?

A. In the year 1881, some of the production of eight of these charcoal furnaces was marketed in Cincinnati; some in 33 Saint Louis and some in Louisville.

Q. Prior to 1886, what did your investigation or study sclose to have been the routes or means of transportation to d from the industries engaged in the production or utilization lead and zinc located on or in convenient access to New River?

A. I know of no attempts to use New River to transport the

products of these lead and zinc industries, and a study of their production—a study of their history discloses that their products were transported by wagon to the railhead, after the constructions of railroads. In the earliest days, prior to the construction of railroads, lead was transported by road to points eastwardly.

Q. In your study of the history of these industries—that is, the lead, iron, and zinc industries that were within easy access to New River, did you find reference to any available water transportation to and from them?

By Mr. THOMPSON. We object to the question.

By the COURT. I believe I will sustain that objection.

AVOWAL

By Mr. JACKSON. We except to the ruling of the Court, and state that through this witness, we offer to prove that he has made a study of the history of these industries, and that he has found, in the historical records, dealing with the beginnings and development of these industries, on and along and over New River, no records of available water transportation, except such transportation from Radford and Boom Furnaces as was referred to in the reports of the Chief of Engineers of the United States Army dealing with the years 1881 and 1882.

By Mr. JACKSON:

Q. Doctor, is there any work of an historical character, dealing with the history of these enterprises, to which you would like to particularly refer?

A. I should like to draw attention to a work entitled "Resources of Southwestern Virginia," showing mineral deposits, etc., of the various counties and methods of transportation, etc., by C. B. Boyd, published in New York in 1881, by John Wiley and Sons.

Q. Will you state whether or not, if you have not already done so, if that work is generally accepted as reliable among students in that field?

A. I have already stated so.

Q. Read such excerpts from that work as you deem pertinent to this point.

A. In treating of Pulaski county along lines of transportation——

By Mr. THOMPSON:

Q. What page are you reading from?

A. I haven't the page, but under Pulaski county——

Q. The title of the book is "Resources of Southwestern Virginia."

A. Yes, the Resources of Southwestern Virginia, published by John Wiley and Sons, 1881.

Q. Have you the book?

A. Yes, sir.

Q. Let's see it.

A. (Continuing.) (Reading:). "This county is directly
2234 in the great line—the great through line of railroads from the Atlantic seaboard, through Tennessee to the west and south. The Atlantic, Mississippi and Ohio Railroad passes through the heart of the county from East to west. New River, besides being in line of navigation improvement under the auspices of the general Government, is also the line of the New River Railroad, now being constructed.

"This is also one of the proposed lines of the Petersburg–Pittsburg Southern Railway.

"The county is well supplied with good county roads, and one of them is a fine macademized turnpike."

In treating the lines of transportation in Wythe county, no mention is made of New River.

In treating of Giles county, at page 157, this is said:

"The New River is contemplated to be made navigable at some date by the United States Government, surveys having been made to ascertain the practicability, costs, etc. Some appropriations have been made and work done on the river, but none in this county."

In dealing with the lines of transportation in Carroll county, at page 294, I find:

"The United States Government had the river examined with a view to its improvement and the officer in charge made a favorable report on the scheme."

In dealing with manufacturies in Grayson county, at page 307, it is said:

"There are very few manufacturies"—

I think that word is spelled wrong. I think the original says "manufactories"—

"in the county, except a carding machine or two and Little River forge now in operation."

Q. About what time are you reading?

A. This was published in 1881. Here is a further paragraph:

"There are the usual grist and sawmills in every neighborhood, but being without the facilities of transportation, there
2235 has been no inducement to build expensive factories of any kind, though the people are sufficiently enterprising."

By Mr. JACKSON:

Q. You referred awhile ago to a work entitled "Reprint of Annual Reports and Other Papers on the Virginias, by Mr. Rogers, I think the State Geologist. Is there any excerpt from that work to which you wish to direct attention as pertinent to your testimony?

A. Yes, sir.

By Mr. THOMPSON:

Q. Have you a copy of that?

A. Yes, sir. [Continuing.] I find on page 111 in that work, this quotation:

"The lead ores of Wythe county, under judicious managing as now working, could, with favorable means of conveying the resulting metal to the proper markets, could not fail to become a large source of profit to the State."

By Mr. GATCHELL:

Q. What page is that?

A. Page 111.

By Mr. JACKSON:

Q. Anything further?

A. Then on page 140, quoting from a report in the year 1836, in speaking of the lead ores, etc., we find:

"The fact that by far the largest portion of the lead which these mines furnish is carried in wagons to Baltimore, is direct proof of the lucrative nature of the manufacture and strongly indicates the benefit which exists in this product and which the public may be expected to reap from the extensive works of improvement which have been so wisely projected in this portion of the State."

By Mr. THOMPSON:

Q. What is the date of that?

A. That was the report for 1836.

By Mr. JACKSON:

Q. Are iron, lead and zinc industries included in what is known as the "heavy" industries?

A. Yes, sir.

Q. State, if you know, whether or not water transportation, where practical, is of any value to such heavy industries?

A. Water transportation, where practical, is of greater benefit to heavy industries, than any other type of industries; yes, sir.

2236 Cross examination by Mr. THOMPSON:

Q. There were no railroads in that country in 1836, were there?

A. Not to the best of my knowledge.

Q. After you put your ore on down New River, where would it go—to the Ohio?

A. If it didn't go to the bottom, it would.

Q. Thank you for that remark. Do you know anything about the New River Navigation Company, chartered by the State of Virginia?

A. No, sir.

Q. You never heard of it?

A. No, sir.

Q. You are an expert on navigation history in this part of the country, are you?

A. I am familiar with the things I have talked about here.

Q. And nothing else?

A. Oh, yes; lots of things.

Q. What was the nearest place for the reduction of lead ore in the United States at that time from New River?

A. I understand that lead ore was so reduced in the vicinity of the mine. It was carried across New River from the mine and handled on the opposite bank of the river.

Q. That is, the shot tower?

A. No, sir; the shot tower is on the same side of the river.

Q. The consumption in this country would be soon satisfied with what they could manufacture in the shot tower there?

A. Yes, sir.

Q. So your excess would have to go to Baltimore, which was the place where they had the great shot tower and they did reduce lead ores?

A. I don't know much about that, but I do know that this was the chief source of lead in the Eastern United States.

Q. Baltimore was?

A. No, sir.

Q. This place was?

2237 A. No, sir; Austinville was.

Q. Baltimore was the place of distribution?

A. No, sir.

Q. Where they made ammunition of one kind or another?

A. I expect so; I have no special knowledge of that.

Q. There would be no point in sending excess lead ore on down the river, after they had reduced it into its particular constituents for the market within that area; isn't that so?

A. It seems to me that the New River furnished the route for a considerable number of miles from the Lead Mines Eastward and Northward.

Q. Where were there any Towns on New River in the year 1836, from the Lead Mines North?

A. I don't know.

Q. There weren't any, as a matter of fact, were there?

A. I doubt if there were.

Q. So your only market was East, wasn't it?

A. It seems that way.

Q. There was no purpose in sending lead ores down New River——

By Mr. JACKSON. When?

By Mr. THOMPSON. In 1836. That is the date that he gave in the book.

Q. That is the date you quoted there, isn't it?

A. If I had been doing it, I would have sought the easiest and cheapest way of doing it.

Q. How do you know going down the river was the cheapest way?

A. I don't know; apparently it was not, or they would have done it.

Q. Even though there was no market there?

A. It was some miles from the Lead Mines to Radford, and Radford would be the natural point for trans-shipment to Baltimore, by team.

Q. Isn't it a fact that there was a road running from up there in that district, and in a Northeasterly direction, to Lynchburg, out that way to Baltimore?

A. There was a road Northeast of the mines, known as the Lead Mine Road.

2238 Q. Yes, sir. And wasn't the means of transportation in 1836, that which would get them to the—that of getting the ores or whatever they shipped, to the James River and on down the canal?

A. I don't get that.

Q. Read the question. (Question is read.) The canal along the James River.

A. Where?

Q. At any point—Covington——

By Mr. JACKSON. When was this?

By Mr. THOMPSON. In 1836.

A. I doubt if there was much navigation on the James River from Covington in 1836.

Q. Isn't it a fact that from Covington down, was the greatest course of carrying commerce in the State of Virginia—that is north or west, in 1836?

By Mr. JACKSON. We object to that. There is no evidence to show that Covington even existed then.

A. I have a reference somewhere that zinc ores were hauled to Lynchburg——

Q. Hauled to Lynchburg——

A. Wait a minute—the suggestion was made that they might profitably be hauled to James River at a point west of the blue ridge, which would be the present Buchanan. I cannot give the reference, but my remembrance is that it said they could carry that in canoes, a ton to two canoes and that meant that at that time, there was transportation for 500 pounds of cargo from Buchanan, but I have no evidence that such transportation was used. It is simply a suggestion.

Q. When was the canal built at Lynchburg on the James River?

A. I do not know.

Q. Isn't it a fact that it was a going business and the biggest corporation in the State of Virginia, so far as income was concerned, in 1836?

A. If I remember correctly, canalization was completed to Buchanan about 1855, but as to the details of the development of that transportation, I do not have the details of.

2239 Q. If there was no demand up the river or down the river, or in Virginia or in West Virginia, wouldn't it be natural to find a market—to find a place where there was a market going East?

A. Yes, sir; you could not find a market where there was no market.

Q. What would be the point in going down the river, then?

A. Commodities seek the lowest cost of transportation. It seems to me that the natural route would have been the water route from the Lead Mines, which were located on the New River, to Radford, and thence by wagon to market—the final destination.

Q. You refer to Radford. When was Radford established?

A. In the early maps of the United States Geological Survey, the locality known as Radford is referred to as Central Lovely Mount, and in these papers published in the 80's, Radford was not known as such at that time.

Q. As a matter of fact, there was no town of any size there in 1836, was there?

A. I have no knowledge of that.

Q. Why would you think that they would ship goods down or material or commerce to Radford. Why couldn't they take the road at the Lead Mines?

A. Of course, they could—as a matter of fact, they did.

Q. Wasn't that the reasonable thing to do.

A. It was, if there was no water transportation. If there was water transportation, the natural route would be to go on water as far as you could, and Radford—where Radford now is, would be the Eastern limit, in my guess, for water transportation.

Q. Why go North and East, when you could go East. You have to go North going on the river.

A. It is my understanding that Baltimore is Northeast of the mine.

Q. You had to go to Lynchburg to go to Baltimore, did you not?

A. Yes, sir; you had to go Eastward, but the natural route of transportation from the earliest times, from New York to Alabama, has been along the limestone valleys, and the
2240 natural route for lead would be the same valley, Northeast.

Q. Even though your river was running Northwest?

A. Are you stating that as a fact?

Q. I am asking you the question.

A. (Examines map.) This is approximately North [indicating on map]?

Q. Yes, sir.

A. This is East [indicating].

Q. Yes, sir.

A. This is Northwest and the Lead Mines are here [indicating on map], and from here to Radford is Northeast [indicating].

Q. How much Northeast is it?

A. About 20 miles by river.

Q. You, as a transportation expert, and an historical transportation expert, now say that they ought to take the lead from Austinville and take it down the river to Radford, and then start it in an Eastern direction, or any direction that it might be, to Baltimore?

A. Some years ago—your question involves an assumption that is not necessarily in accordance with the facts. I am familiar with the region—this lead and zinc region and this Virginia iron ore region that we have discussed. I have little knowledge of transportation outside of that, except as I have obtained from my studies of history—the history of the iron ore industry.

Q. That is your answer to my question: That is your answer, is it?

A. I said further, some years ago, it was my private business
transport hundreds of thousands of tons of tan bark and lum-
er for 16 miles by wagon.

Q. You are now speaking about your own experience. I am
lking about the year 1836. You gave us a reference to 1836.
Vhat this man Boyd or somebody had to say in some book.

By Mr. JACKSON. You are wrong about that.

By Mr. THOMPSON. The Annual Report of the Geology of the
irginias by Mr. Rogers. I am asking you about 1836.

Q. The best answer that you, as an historical expert on trans-
ortation, can make, is that you would take the lead down to
adford, and then start East with it, rather than start East or
ortheast with it from the Lead Mines, when they had a road
here?

A. You keep jumping off the track.

241 Q. I will try to jump back on the track. Will you answer my question?

A. The route down New River is strictly Northeast and trans-
ortation from the Lead Mines down to the site of Radford,
ould be directly in line towards Baltimore.

Q. How far would it be to Radford from Austinville, by river.
ake into consideration all of the bends and curves on the river?

A. I made a slight allowance for that on the scale, when I said
was 20 miles.

Q. It is 20 miles—you say that, do you?

A. I expect it is a little further than that down the river.

Q. As a matter of fact, it is 44 miles, is it not, by the river?

A. (Witness examines map.) The straight line on this map,
cording to my guess, it is 15 miles, if that map is correct.

Q. I am not asking you that. I am asking you what is the
istance by the river from Austinville to Radford?

A. I never measured it.

Q. You told the Court that you would take an ore shipment
Radford by the river and go east then, did you not?

A. That is my judgment of the way it should be done.

Q. That is the best answer that you can give, is it?

A. Yes, sir.

* * * * * *

Q. I would like to ask you something about this Defendant's
xhibit #550. You say this is a very reliable map, do you not?

A. The man who made it said it was particularly good, be-
use it was based on the Norfolk & Western survey as a base
ne.

Q. That would necessarily make it good, would it?

A. Well I presume the Norfolk & Western employed competent engineers, if they were going to spend a few million dollars building a railway.

* * * * *

2242 Q. I would like to ask you with regard to the iron ore deposits up on New River. Do you understand the term in mining called "gophering"?

A. I have heard it used.

Q. You have been in the West?

A. Yes, but not extensively, that is not for a very long time.

Q. Is it or not true that up the head waters, the upper region, there is a large deposit of iron ore throughout that country?

A. Not throughout the country. The iron ores that were mined for these charcoal furnaces were mostly in the form of nodules, scattered through the residual clay, which overlies the limestone of the Great Valley region.

Q. Isn't it true up around Foster Falls and all through that stretch there is a great seam, or deposit, we will call it, of iron ore, that runs through that country for a stretch of about thirty miles?

A. No such thing as a seam.

Q. I will withdraw the word "seam." What is the word for it?

A. Those as I said were nodules or iron ore scattered through the clay, sometimes they constituted as much as one-third of the total materials and other times they constituted not more than one ton in twenty. The iron ore was obtained from the clay by a washing process; many times they recovered less than one-twentieth of the amount of material they put through the washer.

Q. Isn't it true that really what they have done up there to a very great degree, not entirely, but they have really been gophering where they got a deposit that was rich they took that out and left the low-grade ore there?

A. What would you consider a low-grade ore?

Q. I am not an expert on iron ore, I could not tell you—I could on gold or silver, but not on iron ore. I have been in the district and that is the impression I got, and ask you if that is correct?

A. Let's make a correction on gophering. You are familiar with gold and silver, and gold and silver can occur in great values in a very small place, and you can properly call that go-

2243 phering. Now iron ores do not. They are a bulky material, and when you are getting one ton of ore out of twenty tons of material it would be a gopher that resembled the dinossurs of old—you are trying to get at the amount of ore left there?

Q. Yes.

A. Those deposits have been practically exhausted.

Q. Would you say this iron ore in the Southwestern part of Virginia along the river is gone?

A. No; those residual ores in the limestone clays have been largely exhausted; there are several deposits which I understand have not been completely mined out, but there is a deposit of ore in Carroll County which is being mined primarily for its sulphide content on a considerable scale and hauled to Pulaski where it is used in the production of sulphuric acid and the iron which was in the original material is a by-product.

Q. That gets close to what I am trying to being out. In other words, you still have a deposit left, which if it came to a necessity, suppose you exhausted your Lake Superior and Michigan deposits, there would still be something left up New River, wouldn't there? That is low-grade?

A. It is not low-grade, but it is the sulphide, and I do not know of a single case where a sulphide ore has been mined as an iron ore; in many cases sulphides of iron have been mined for the sulphuric acid content, and the by-product of those operations used as an iron ore. At the present time there are quantities of this material, which is called "Blue Billy" stacked at the City of Pulaski, for which there is no market.

Q. Coming to the lead mine, what is the deposit there?

A. It is what we call a disseminated ore.

Q. Is there ore left there?

A. There was the last time I was in the mine.

Q. And there is zinc there?

A. Yes, sir.

Q. And still quite a lot of zinc up in that part of the country?

A. If you knew the New Jersey Zinc Company you would know they are not going to let anyone know how much reserve they have there.

2244 Q. I know the New Jersey Zinc Company, and I know they wouldn't let anyone know, but as a matter of fact they have got reserves there, isn't that true?

By the Coukr. Ask the witness if it is in his knowledge there is considerable zinc reserve there.

A. The last time I was down in that mine they were mining zinc, and I saw zinc in the walls. I haven't the slightest idea whether there is any zinc a foot away from those walls or not; presumably there is, but I have no knowledge of the tonnage held in reserve.

Q. How about lead?

A. They are intermingled, the lead and the zinc.

Q. In your study of geology up that river, have you noticed the fact there are quarries up there that are valuable stone quarries?

A. What kind of stone quarries?

Q. For instance one right near the Radford project where they got out a lot of rock and shipped it, haven't they?

A. I understand that was opened for limestone deposit, and the people who opened it had not made adequate investigation and found the limestone there was of very limited value and since that time they have been mining the dolamite which has been used for crushed stone.

Q. That is being used and shipped?

A. The last time I noticed it was being used.

Q. There are sand deposits up that river?

A. What do you call sand?

Q. For cement works, etc.

A. Unfortunately some of that sand has been used for cement work.

Q. And it worked out?

A. Yes, it worked out dreadfully.

Q. You don't think there is sand up there for that industry?

A. Anyone that wants to can use it, but not in any of my concrete will there be any of that sand.

Q. There are also clays up there that are valuable?

A. There is a plant up there producing ochre.

2245 Q. Do you know any other geological deposit up there valuable for any commercial purpose?

A. I can conceive of a whole lot of things that could be used up there, but off-hand I don't think of anything that has much commercial prospects.

Q. Any coal up there?

A. No.

* * * * *

Q. You referred in your examination in chief to an engineer by the name of Boyd, who, I believe, has written quite a volume on geological matters in the State of Virginia?

A. I referred to Boyd, yes.

Q. Is he regarded as an authority?

A. Mr. Boyd was a Wytheville man, and it is my understanding that he traveled widely over this country and probably had better first hand knowledge of the country than anyone else I can imagine.

Q. Now, did you read his report that was attached to the report of Major Craighill in 1872?

A. I glanced through it. I did not read it critically.

Q. When did you do that?

A. Oh, a week ago.

Q. And not previous to that time?

A. No.

Q. Do you recall this paragraph in his report:

"Assuming that the mineral interests of the country tributary to New River are, or will be, of paramount importance, I have devoted the body of this report to that subject.

"That section of country contiguous to and likely to supply tonnage at once to a New River improvement, beginning at its southwestern limit, is the following: A part of the counties of Ashe, Alleghany, and Surry, in North Carolina; parts of the counties of Carroll, Grayson, Wythe, Pulaski, Montgomery, Bland, Tazewell and Giles, in Virginia; and the counties of Mercer, Monroe, and Summers, in West Virginia; com-
2246 prising an area filled with apparently inexhaustible deposits of iron-ore of high grade, coal, lead, zinc, copper, baryta, salt, alumina, sandstone, (millstone and grindstone grit), limestone (both ordinary and magnesian), and sometimes strong indications of beds of gypsum, some of which leads of ore are exhibited nearly in their actual position upon the accompanying map."

Do you recall having read that?

A. I don't remember the detail wording. I can well imagine that it is there.

Q. Do you agree with that statement?

Mr. JACKSON. I suggest that he show it to the doctor.

Mr. THOMPSON. I was reading from Government Exhibit No. 31 (handing same to the witness).

A. The question is if I agree with that?

Q. Yes.

A. To a certain extent, in some respects, it was too optomistic and in other respects was not optomistic enough. In those days the knowledge of ore deposits was not what it is now. Someone has said that the only good description of a mine is an obituary and in many cases ore deposits turn out to be vastly greater than the report indicates. I could call your attention to a number of instances of that kind in Virginia.

Q. Are any of them up in the New River district?

A. No, I can't say that there are, but I feel quite sure that the early geologists did not visualize even approximately the form in which these ore bodies occurred. I doubt if they realized that there was as much zinc as there has proved to be in the Austinville mines.

Geologists in those days were inclined to think of things in leads; they were inclined to think of veins of indefinite extent; they would find a deposit in one point and another hundreds of miles away, and draw a line between, and assume that they had had solid ore all between. While it was not proper it was quite generally done.

Q. But, generally speaking, you would agree with his report, would you not?

2247 A. I would agree with that part of the report which deals with things which, as an ordinary individual, he could see from his own observation.

Q. And you did consider him a man, I think you said, about as familiar as anybody with that part of the country?

A. First, I was not back there at the time, but I understand he spent many years doing very little else than going back and forth over that country looking into mineral possibilities.

Q. Have you heard of the discovery of manganese up the river?

A. Where?

Q. On New River, or are there any manganese deposits?

A. How close to New River?

Q. Well, I couldn't tell you that, but the Press has carried that story from time to time within the last three years. In Montgomery County and Giles County?

A. There is a deposit that is being mined on the Bland-Giles County line at the present time, and it was a right promising deposit. Now, there are two appearances in Montgomery County that have been prospected in recent years, but I gather that they are more promotion than mining operations.

To be specific, representatives of the large interests came down here from New York, and got me to take them to see what was characterized as a million tons in Montgomery, and it was within quarter of a mile of New River. I said it was a waste of time to go down there. They said, "Well, we came all the way from New York to see it." Well, I said, "I will take you down there." I took them down there.

Q. Was this in Montgomery County?

A. Yes. It was on the corner of Montgomery, Giles and Pulaski. I said, "Here is your mine; now, show me the manganese," and they were unable to even show me a specimen; they were unable to show me anything that I was willing to admit was manganese. So there have been some very large stories about manganese in that section of the country, which have no basis whatever. There is a little manganese which has

2248 been mined not far from New River.

Q. In what form does manganese appear?

A. Mineralogically or geologically?

Q. Mineralogically?

A. Three forms—mineral——

Q. I mean, in what form is the deposit physically?

A. You mean geologically?

Q. Yes.

A. In this country it is a superficial deposit, the result of weathering activities, and in the Butte region it occurs in vein form and occurs at depth, but here manganese is limited to mere surface appearance. We have a number of these occurrences in Virginia. One of them, in the Allegheny Mountain region, in association with the Oriskany and sandstone. We have manganese again along the west base of the Blue Ridge.

Q. I want particularly down through that part of the country along the river. That, you say, is the surface form?

A. It occurs disseminated at shallow depths. I do not know of a single deposit that could be called manganese ore that is contiguous to New River. There are some deposits that have been mined there with iron ore rather high in manganese.

Q. Have you heard of deposits, exposed or prospective, at Dennison?

A. Where is Dennison?

Q. I think either Montgomery or Giles County.

A. I never heard of Dennison.

Q. Have you ever heard of Herron?

A. No.

Q. Eaton?

A. No.

Q. Linkous and Shumate?

Mr. JACKSON. Are they towns?

Mr. THOMPSON. That is the way it is designated, as "Linkous and Shumate deposits."

2249 A. What is the name of that?

Q. A manganese deposit in western Virginia by G. W. Stose, 1922?

A. I do not know of any deposits by that name that have ever amounted to anything. The only deposit in the report in this region that amounted to anything was the one I mentioned on the Bland-Giles line, and that is known as the Stange mine.

Q. That covers 27,500 acres, doesn't it? The Stange?

A. The number of acres that it covers depends on the number of acres Mr. Stange owns. Mr. Stange owns a large boundary up in there, but, so far as I know, he has never opened that except in one place, and he has done all his mining in one particular locality.

Q. Where is that located with respect to New River—how close?

A. May I get a map?

Q. Yes.

A. I would answer 16 miles in a direct line.

Q. Now, have you heard of the others which are referred to in the Stose report of 1922—the Hare?

A. I am very much interested in manganese and consider that the Oriskany manganese and the Oriskany iron ore have had approximately the same origin. So it has been my business to visit the manganese deposits which seem to be of the Oriskany type.

Q. Have you ever been on Beamer?

A. No.

Q. On No Business Creek?

A. I know where it is, but I have not visited any manganese deposits on this.

Q. On Flat Top?

A. I am not sure where Flat Top is, but I do not recall having visited it.

Q. On Johnson?

A. I don't think so.

Q. On Thompson?

A. I don't remember it.

2250. Q. Isn't it a fact, Doctor, that you have made your transportation study within a very recent date?

A. In connection with my study of the history of the iron ore industry, transportation has been a part of the study. I gave particular attention to the early ore industry, particularly before the development of the coke furnace, and the charcoal furnaces were, for the most part, located close to their ore supplies, and the transportation there was mostly by cart or by wagon, and there was little occasion to give attention to that. I was concerned to a small extent with deposits of other products, pig iron products, but my business was mostly concerned with the ore itself, and I was supposed to rest when I got it to the furnace, and I might say my study of transportation has been contemporaneous with my study of iron ore deposits, and that runs over a period of 35 or 40 years.

Q. Did you ever talk to a man by the name of R. L. Howard whose father operated the Howard's Ferry and who has testified in this case?

A. I don't recall.

Q. Did you ever talk to a Mr. William Collins, who lives at Salem, Virginia, and who in the early days lived at Towe's Ferry on New River, and who has testified in this case for the Government?

By Mr. JACKSON. I think you should specify the time.

By Mr. THOMPSON. Any time.

By Mr. JACKSON. That is too vague and indefinite for cross examination.

A. My dear sir, some days there are a dozen people in my office and I don't know their names.

Q. So far as you know you have never talked to Mr. R. L. Howard, or Mr. William Collins about the boating of pig iron down New River, have you?

A. If I did I have forgotten it, or I did not know his name at the time.

Q. And you didn't make any notes about it?

A. I don't remember any.

Q. Did you ever talk to a man by the name of Lewis Harvey, whose farm is located near the Radford dam site, in fact just back of the dam site?

A. In as much as I spent about three years in that vicinity, I might have easily talked to Mr. Harvey, but I do not recall it.

Q. You did not make any notes of it?

A. I don't recall it.

Q. Did you ever talk to J. W. Flannagan who resides at Radford and who testified for the Government?

A. I have talked a good many times to a man named Flannagan, but I do not recall discussing iron ore or New River problems with him.

2251 Q. With none of these men did you ever discuss the question of boating iron ore down the river, or pig iron?

A. I don't recall I ever did.

Q. I believe you testified you found no historical reference to transportation of pig iron by boat later than the year 1882 or 1883?

A. I don't recall finding any.

Q. You say you don't recall?

A. I don't recall finding any such records.

Q. I will ask you if you do not know the cessation of transportation by boat of pig iron was occasioned only by the closing of the furnaces in 1884 or 1885?

A. No, I don't know that.

Q. You don't remember it or you have never known it?

A. The records indicate the furnaces continued to produce.

Q. And do you know the closing of the furnaces was occasioned by general business depression about that time?

By Mr. JACKSON. I object to that question. He testified they didn't close.

A. It is a rather strange thing that these furnaces continued to operate after the poor prices of iron set in. They had had prices on iron which were double the prices which prevailed subsequently and it resulted in a large amount of furnace building and rebuilding. In the early eighties they had what was for the owners a very large investment, and at the beginning of 1883 the prospect in the iron manufacturing business was very gloomy indeed.

The records showed the Virginia production of iron 14,000 or 16,000 tons in '80, '83 and '84. Prior to that time 75% or 73% to be correct and exact was produced by the furnaces along New River. It is a reasonable expectation that a corresponding percentage of that 14,000 or 16,000 tons was due to the furnaces along New River; therefore I think I am justified in saying the furnaces did not shut down completely. As to why they shut down, how can I say that it was due to the depression?

Q. I believe you said you read the reports of the Chief of Engineers, did you not?

2252 A. I glanced through them.

Q. That was one of your sources of information you had, as you testified on Friday?

A. I looked through them, particularly with a view of seeing what transportation they recorded as having taken place on New River.

Q. I direct your attention to Government Exhibit #42, the same being the Annual Report of the Chief of Engineers, War Department for the year 1886, page 1602, being a part of the report of Col. William Proctor Smith, Assistant Engineer in charge of channel improvement on New River, to Lt. Col. William P. Craighill, under date of November 30, 1885, and read to you as follows: "It is not necessary to say anything about the other two divisions of New River, as there was no work done on them, nor were the channels examined; but from inquiries it is thought that the channel-way made in former years still keeps open, and bateaux are in constant use on them, iron having been shipped to New River Bridge up to the time of the suspension of the furnaces by the prevailing hard times."

Now do you agree with that statement?

A. My judgment is while this fellow might have been a good engineer he wasn't much of an economist, "but from inquiries it is thought the channel-way made in former years is still open." You will notice he is not sure the channel-way is open, and furthermore you will see he has not made a personal investigation. The sentence continues "and bateaux are in constant use on them." The balance of that clause beginning with "and" and ending with "them" is predicated on the inquiry which he had made, and not on personal observation, and he don't seem to be very sure about it.

Q. Don't you think Col. Smith was in a better position, he having been located on that river, than you are today, to tell what the conditions were there?

A. I don't see you have reliable evidence here there was any iron transported under the date of this report, or immediately preceding it.

2253 Q. I am asking, isn't his statement the suspension of the furnaces by prevailing hard times—that he would be in a position to know that better than you?

A. I would not be convinced to that statement that William Proctor Smith was correctly informed, particularly when we have statistical data to the contrary.

Q. Didn't you give this report as one of the sources of your information?

A. I had looked over this, and saw the item you referred to, but I didn't consider it reliable evidence in view of the other information I had that transportation was continued.

Q. On page 5017 of your testimony you said in reference to your sources of information, that you consulted Thomas Jefferson's notes on Virginia. Will you please tell us where there is anything in Thomas Jefferson's notes on Virginia discussing the question of the transportation of pig iron or iron ores?

By Mr. JACKSON. I object to the form of the question, because the witness never testified he consulted Jefferson's notes about pig iron, but about lead and zinc.

Q. Let's go back to your testimony, page 5016 and 5017: "Dr. Holden, will you state what historical sources you have examined or considered in connection with the question of what route and means of transportation were employed by these charcoal iron furnaces and lead and zinc industries on or near New River and prior to 1886, when the Cripple Creek Railroad was built up to Foster Falls?" I am asking if there is any reference in the Jefferson document you speak about with respect to the roads upon which the ore was transported or the means by which the iron, the pig iron was transported?

A. He said iron or lead or zinc. I don't recall any reference in Jefferson in regard to iron but there is reference in regard to zinc.

By Mr. JACKSON. And lead.

Q. I am asking about pig iron.

By Mr. JACKSON. He has told you.

A. I answered that.

2254 Q. So you say there is no reference with reference to pig iron?

A. There is a reference in regard to iron in eastern Virginia.

Q. But not along New River?

A. I don't recall any such reference.

Q. You would recall it if there was such reference there?

A. If I had seen it I probably would.

Q. You have it in front of you?

A. Yes, sir.

Q. And there is no reference there?

A. I don't see any.

Q. You also in answer to Mr. Jackson's Question gave as one of your authorities the Virginias. Will you indicate in the Virginias Magazine in 1882, Vol. 3, page 52, and 1833, Vol. 4, page 5, where it makes any reference to the manner of shipment or transportation of pig iron?

A. In paragraph #1 it is said, "The iron made was sold in St. Louis, Cincinnati, Baltimore, and Wilmington," and paragraph #4 he makes the same statement.

Q. Does he say how the pig iron was transported?

A. It does not say how it was transported.

Q. So it doesn't show whether it was carried down New River by boat or any other way?

A. It doesn't say how it was transported.

Q. Have reference now to the 1883, Vol. 4, page 5, is there any reference there as to how the pig iron was transported?

A. In paragraph #7 he speaks that the furnaces had to blow-out on account of scarcity of transportation.

Q. But it doesn't indicate what kind of transportation?

A. Not in that paragraph.

Q. Or in any paragraph there?

A. I don't see any.

REDIRECT EXAMINATION

Q. During your cross examination on Friday, Dr. Holden, you were asked what was the distance from the Lead Mines to
2255 the point on New River where Radford now is, and I wondered if since that time you have checked that over?

A. I based my answer on this map, and I can see now I went from the extreme ends of the scale and not from the zero point.

Q. Will you state now what the distance would be approximately?

A. From where to where?

Q. From the Lead Mines northeast to the curve of the river, approximately to where Radford now is?

A. Well in a straight line I would estimate it was twenty inches which would make it forty miles, by river.

Q. About how far would it be about by the Lead Mines road to a point approximately opposite the curve of the river near Radford?

A. You said by the Lead Mines road?

Q. Yes, if that is the right road.

A. The Lead Mines road would not be the road which you would take today to go from the Lead Mines to Radford because there is a poor, indirect road from Childress to Radford.

Q. What I would like to get would be what would be the comparative distance by road from the Lead Mines down to the curve of the river near Radford?

A. I would make a guess there wasn't much difference.

Q. Between that and the distance you gave by river?

A. Yes, sir.

Q. And does that road which you now refer to pass along the river at Allisonia?

A. Yes, sir.

Q. And about how far from the river is it when it goes down to the vicinity of Radford or where Radford now is?

A. Well the road which existed at the time this map was made is directly at the river.

Q. Before the railroad do you know whether the through road crossed at Ingles' and Pepper's Ferry?

A. I think Jefferson speaks of the zinc being hauled to Lynchburg, and I think in that case they would have stayed on
2256 the south side of New River and gone through Christiansburg.

By Mr. JACKSON. I produce what appears to be a letter in longhand addressed to Dr. J. E. Williams, Dean V. P. I., Blacksburg, Va., dated February 2, 1936, and signed by R. J. Noell, and ask to have it marked "Defendant's Exhibit #551" for identification. (Letter marked as requested.)

I also produce what appears to be a carbon copy of a letter dated March 2, 1936 addressed to Hon. R. J. Noell, East Radford, Virginia, and without signature, except "Dean of the College" and bearing the initials "JEW" and ask to have it marked "Defendant's Exhibit #552" for identification. (Letter marked as requested.)

I also ask to have marked as "Defendant's Exhibit #553," for identification, letter on the letterhead of Virginia Polytechnic Institute, Department of Geology, Blacksburg, Virginia, dated March 4, 1936, addressed to Hon. R. J. Noell, East Radford, and appearing to be signed by R. J. Holden, Professor of Geology. (Letter marked as requested.)

Q. Dr. Holden, you have already I think identified the letter I have had marked Defendant's Exhibit #553 for identification, as the letter which you wrote to R. J. Noell. Is that right?

A. I think this is the letter.

Q. I direct your attention to the first paragraph in which it says, "Your letter to Dean Williams and a copy of his letter to you have been referred to me," and show you Exhibit #551 and 552 for identification, and ask you whether #551 is the

letter of Mr. Noell referred to you, and if #552 is a copy of the letter Dean Williams referred to you?

A. I believe them to be.

By Mr. JACKSON. We offer in evidence Exhibits #551–552–553 in connection with the examination of Dr. Holden.

By Mr. THOMPSON. No objection to them going in.

By Mr. JACKSON:

Q. I am not sure whether I asked you what is your position in the Department of Geology at Virginia Polytechnic Institute?

A. I am the head of the Department and have been for twenty-nine years.

By Mr. JACKSON. I would like to read the letters just filed, if the Court doesn't think it will take too much time.

By the COURT. All right.

NOTE.—Whereupon letters filed as Exhibits Nos. 551, 552 and 553 were read by Mr. Jackson, as follows:

"2-28-36

EAST RADFORD, VIRGINIA.

Dr. J. E. WILLIAMS, Dean V. P. I.

Blacksburg, Va.

DEAR MR. WILLIAMS: I would be very glad to get as much information about the old iron furnaces that have been operated along New River as can be reasonably obtained. What furnaces, when they started, how operated and how long. The iron ore supply and how transported to the furnaces, especially as to being carried in boats on New River, also the disposition of the pig iron and how it was carried to railroad or the market; as to that located down the river and that hauled by teams from and to what places; especially that going down the river and any shipments out of the State. Also as to lumber, tan bark,
2257 staves, logs, wheat, corn and provisions or any products carried in boats up or down the New River and when, from and to what point, passengers, etc.; as well as rafting logs, staves, lumber, etc. I understand your library contains a copy of T. L. Watson's "Mineral Resources of Virginia" and which contains on pages 402–488 a chapter of Dr. Holden on iron, and this article contains on page 479 a list of furnaces in Virginia, also a book in your library "Virginia Iron Manufacturers in the Slave Era", by Kathleen Bruce. This book was published in 1931 and opposite page 452 it contains a map of Virginia showing the location of the iron furnaces in Virginia with names and considerable information as to some of the furnaces.

"I understand Dr. R. J. Holden is the best authority on these matters and I would be obliged if you could talk to Dr. Holden

and apprise him of our appreciation of any information he will give us.

"My best wishes to you and Dr. Holden.

Very sincerely,

R. J. NOELL."

Then there is a footnote saying:

"Dr. WILLIAMS: If not asking too much will you kindly get your stenographer to type three copies of this letter and mail to me in your reply, as I am so pressed for time I could not look up a stenographer?

RJN"

Now #552:

"MARCH 2, 1936.

Hon. R. J. NOELL,
East Radford, Virginia.

DEAR SENATOR: Your letter of February 28 has been received and is being referred to Dr. R. J. Holden who, I am sure, will be glad to give you such information as he may have. Dr. Holden knows more about furnaces than all of us here put together. In fact, in my opinion, he knows more about them than anyone else in Virginia.

"Louise was glad to make three copies of your letter, and I am enclosing them herewith.

Very sincerely yours,

_____,
Dean of the College.

JEW:LA
Enc.

2258 #553 reads:

"VIRGINIA POLYTECHNIC INSTITUTE,
DEPARTMENT OF GEOLOGY,
Blacksburg, Virginia, March 4, 1936.

Hon. R. J. NOELL,
East Radford, Virginia.

DEAR SIR: Your letter to Dean Williams and a copy of his letter to you have been referred to me.

"To give you all the information in regard to the furnaces on New River and Cripple Creek in typewritten form will require a large amount of typewriting. A description of these furnaces was published in 1858 in the IRON MANUFACTURER'S GUIDE. This gives all the furnaces and forges that were known at that time. It contains some information on iron operations that had been abandoned scores of years before that time. A record of the

operation of these furnaces from 1876 to recent time is contained in the printed records of the American Iron and Steel Association, copies of which are available in the Congressional Library in Washington. In the VIRGINIAS, a magazine published by Jed Hotchkiss, Staunton, 1880–1885, there is rather detailed information in regard to furnaces of this region, mostly from the pen of John W. Robinson.

"Last year J. A. Whitman of Wytheville, Virginia, published a twenty-page pamphlet entitled THE IRON INDUSTRY OF WYTHE COUNTY FROM 1792. I presume you might be able to obtain a copy of this from Mr. Whitman.

"While I have first-hand knowledge of all of the furnaces in this region which were standing thirty years ago, my memory is vague in regard to some of them, and I will have to consult my notes and read through a large number of notebooks and find scattered items which will be contained therein. If you cannot obtain this information in printed form and will tell me definitely just what information you require, I will see what I can do to get it for you.

Very truly yours,

R. J. HOLDEN,
Professor of Geology.

2259 Q. Dr. Holden, did you ever receive any reply to your letter, Exhibit #553?

A. I don't recall I ever did.

RECROSS EXAMINATION

Q. If I understood you correctly, I understood you to say that ore hauled from the Lead Mines would go by way of Snowville to Christiansburg, on that road. Am I correct in that understanding?

A. I do not know that I said that, but the easiest road from the standpoint of the topography of the country would be along the Great Valley, possibly as far as Roanoke, and such a route would take them through Christiansburg.

There is a shorter route by going across and through Floyd County, possibly across part of Carroll, but it is a very rugged country and I doubt if anyone would take that route with heavy haulage at that time.

Q. There has never been any road down the river from Austinsville to Radford that anybody ever attempted hauling any heavy loads, has there?

A. Part of the way it was close to the river, and part of the way it was not very close, but even at Christiansburg that road is only, in a direct line, about seven miles from the river.

Q. The most direct route was by Snowville, was it not, from the Lead Mines and to Christiansburg?

A. I think it would be.

2260 H. S. SLOCUM on Direct Examination testified as follows:

I am an engineer in charge of construction of the Winfield Development of the Kanawha Valley Power Company, an engineer in charge of construction, Appalachian Electric Power Company, Radford Development. I have been with the Appalachian Electric Power Company since May, 1929. I am also employed by and I have been with the Kanawha Valley Power Company since May, 1934. I spend most of my time with the Kanawha Valley Power Company at Winfield, and part of the time at Radford.

(Witness identified an album, Defendant's Exhibit 554, containing 60 photographs and the map in front of the album on which are the words "Appalachian Electric Power Company, location map for pictures, re—navigability of New River.")

I had those photographs taken in November, 1931. They were taken from a point about 2 miles below Austinsville to a point about one mile above Eggleston. I did not take the pictures myself. They were taken by a photographer named C. D. Fowler of Bluefield, West Virginia. He took them in my presence and in pursuance to my direction and request.

Q. Do the pictures appearing in this album represent a fair and accurate portrayal of the river and the riffles referred to in each photograph, at the time they were taken?

A. Yes, sir.

Q. Now please look at the map in front of the album on which are the words "Appalachian Electric Power Company, location map for pictures, re—navigability of New River," and state whether or not the photograph, or rather the location of the numbers from one to sixty appearing on that map indicate the reasonable proximation of the places where the pictures similarly numbered were taken along New River?

A. Yes, sir.

By Mr. ABBOT. We now desire to offer this album, containing 60 photographs, and the identification map in evidence. The identification map is not offered as any evidence of the

2261 State Line, or anything like that, it is simply offered with reference to showing the location where these pictures were taken for the use of the Court and counsel.

(Said album, together with the identification map and the 60 photographs is here filed in evidence, and is marked Defendant's Exhibit 554.)

The first series of photographs were taken on the 4th, 5th and 6th of November, and the second series were taken on the 24th, 25th and 26th, of November. The part of the river involved in the pictures taken on November 4, 5, and 6, is that stretch of the river from a point 2 miles below Austinsville down to a point one mile above Eggleston. The section of the river involved in the photographs taken on November 24, 25 and 26, was practically the same stretch of river, at least a great part of the same stretch was taken in the second series. We started on November 4, from a point 2 miles below Austinsville, about 9 o'clock in the morning. From the point where the first photographs were taken down the river to Foster Falls, the transportation was by means of an automobile. From Foster Falls we transported the photographer and camera in a boat. We started down the river from Foster Falls around 10 o'clock in the morning.

Q. Why did you take a boat at Foster Falls?

A. When I received instructions to take these photographs there seemed to be two alternatives to use to transport the photographer and the equipment, one was to walk the entire distance along the river and the other was to use a boat to transport the photographer and equipment. There are no roads paralleling the river at that point.

The boat was 19½ feet long, 3½ feet wide, and about 18 inches deep. When loaded with the 4 men and the equipment it would draw about 5 inches. In this country, this type of boat is called a canoe. In the Ohio River country it is called a John boat and in the north it is called a Punt. It is entirely different from what is usually termed a canoe. It is made out of plank, very roughly made and strongly made, and is utilized for rough work and rocky rivers. It stands a great deal of punishment. The boat came from the Radford Development. They had it around there and used it in transporting the men across the river, or ferrying them across the river.

2262

When we left Foster Falls we expected to reach Whitt's Ferry on the first day. On the first day we reached Allisonia at 5:30 in the afternoon and the men were tired and wet, and we decided to stop there for the night, we had to. We had gone about 10 miles. It was a very rough trip, the boat was grounded a great many times, and it was necessary for the men who worked the boat to get out on the rocks and pull it over the ledges, and sometimes it was necessary for the passengers to get out and help to work the boat over, and at other times it was necessary for the passengers to walk along the shore to permit the men to lead the boat over the long stretches of shoals.

In one place the ledges ran parallel with the course of the river, and it was very difficult to find a place through these ledges to

get the boat through. The ledges ran parallel with the river in one place, around a bend of the river. That was below Foster Falls, I don't know exactly but I would say 2 or 3 miles below.

We had 2 workmen on the boat, one for the bow and one for the stern. They got the boat down the river by using paddles whenever there was slack water, but most of the time it was necessary to pole it down and they used poles to fend the boat from the rocks, and also to pry it off the rocks when it was hung up. In several cases it was necessary for the photographer and myself to get out of the boat because the river was so shallow.

The first day, November 4, about an hour and a half was consumed taking photographs, I did not keep track of it.

On November 5 we covered that section of the river from Allisonia to Old No. 6 Dam Site. We left Allisonia at 7 o'clock in the morning. The men took the boat down the river to Clark's Mill, and the photographer and myself went along the shore in an automobile over a stretch of about 4 miles. There was a road paralleling the river for that stretch of about 4 miles. We left Clark's Mill about 8:30 and went down the river and landed at Whitt's Ferry. We used the boat from Clark's Mill to Whitt's Ferry. We left Whitt's Ferry about 4 o'clock. The trip
2263 that day in the boat was more difficult and more arduous than on the preceding day, the rocks were more numerous, and while there were not so many shoals, the ledges were higher and more dangerous and the boat was in danger of capsizing several times.

The photographer and myself did not stay in the boat all that day, we got out on that day several times to permit the men to lead the boat down while we walked down the shore. I would not say the trip was made in good time, because it was very difficult to work the boat, it took a great deal of time, and also took time to find openings through the ledges which would be wide enough to permit the boat to go through. It is about 6½ miles roughly speaking from Clark's Mill to Whitt's Ferry. After we arrived at Whitt's Ferry, we transferred from the boat to an automobile and went down the river along the road which parallels the river.

On November 6, we started at the city of Radford. On the day before we had gone from Allisonia to Old No. 6 site which is about 4 miles above the present Radford site. On this first expedition of 3 days, we did not cover the river entirely between Development No. 6, and the town of Radford. On the morning of the 6th we went up as far as Ingle's Falls, or Ingle's Ferry and took pictures of that and then went down the river.

On the second trip, November 24, 25 and 26 we covered practically the same stretch of river as we did before, or a large part of it.

On the 24th of November, we covered a stretch between McCoy and the city of Radford. McCoy is just above the Big Falls on the Giles-Pulaski County line. On that day we used an automobile for transportation.

On the 25th we took a boat from Owen's Ferry to Whitt's Ferry—in other words, we went by automobile to Whitt's Ferry then drove across country around to Owen's Ferry and then took a boat from Owen's Ferry to Whitt's Ferry.

On the next day we went to Foster Falls, and had the same boat we used on the previous trip, and the same men, and went from Foster Falls to Allisonia. We had about the same experience as we had before, it was very difficult and arduous.

On the 26th we covered that section of the river between
2264 Foster Falls and Dalton, just below Allisonia. The boat was taken up to Foster Falls on a truck from the Radford Development. Allisonia is 3 or 4 miles from Delton. At Allisonia we sent the boat back to Radford on a truck.

Q. Do you know what the stage of the river was when these photographs were taken?

A. It was low, the river was low.

Q. Why did you take the pictures in this low-water season?

A. I was told to take the shoals, to take the rocks and anything that would show the real character of the river bed. It would seem that that time was the best time to take them, at least we thought the best time to take the pictures was when the water was low.

Q. Are there pictures here covering the entire river from below Austinsville to above Eggleston?

A. No, sir; they do not cover the entire river.

Q. What part of the river did you take then?

A. We took the most conspicuous and prominent ledges, shoals, rocks, and obstructions.

Photograph No. 1 is a view taken from the left bank looking up stream showing ledges and projecting rocks. It was taken 2 miles below Austinsville, or about 2 miles.

Photograph No. 2 shows a more close up view of the same ledges crossing the river, 2 miles below Austinsville. Both of these pictures were taken from a point approximately 2 miles below Austinsville. Photograph No. 2 is intended to show more details than No. 1. It shows the depth of the shoals, the height of the ledges, and things of that sort.

Photograph No. 3 is a view from the right hand bank at the lower drop of Foster Falls looking up stream. It shows the ledges crossing approximately at right angles to the stream, also numerous water worn boulders in the foreground. The man in the foreground is W. H. Smith, who was one of the men that helped to work the boat down the river.

Photograph No. 4 is a more detailed photograph showing the same ledge as is shown on the previous photograph, with W. H. Smith in the foreground, and it gives a comparison of the
2265 height of the ledge. That is the ledge further down stream at Foster Falls.

Photograph No. 5 is a view taken from the left bank looking up stream and across the stream to show in a general way the ledges crossing the river at Foster Falls. This picture was taken from an elevation looking down on the ledges.

Photograph No. 6 is a view just below Foster Falls Ferry and shows Foster Falls in the background, shows the ferry, also the ferry boat, and also shows the ledge from which the previous photograph was taken or the bluff on the river bank.

Photograph No. 7 is a view ¾ of a mile below Foster Falls showing a ledge extending approximately at right angles across the river ¾ of a mile below Foster Falls. This was taken from the right bank of the river. The man in the foreground is one of the workmen who took the boat down.

Photograph No. 8 shows a ledge ⅞ of a mile to a mile below Foster Falls, which ledge extends across the river and shows a gravel bank along the river and a gravel bar across the river. It boat was left for comparison with the ledge in the distance. The boat was left for comparison with the ledge in the middle of the picture. I believe that is the same ledge that is shown in Photograph No. 7. The ledge furthest up stream is the ledge shown on Photograph No. 7.

Photograph No. 9 is a view from the right bank, 3 miles, about 3 miles below Foster Falls, showing the ledges crossing the river and boulders in the foreground, and some projecting rocks.

Photograph No. 10 was taken from the right bank, taken from the Norfolk & Western grade, looking down on the ledges and shows several ledges crossing the river and also rocks projecting from the water. That picture was taken roughly 3¼ miles below Foster Falls.

Photograph No. 11 was taken slightly down stream from the point where Photograph No. 10 was taken. It shows the same ledges in the distance.

2266 Photograph No. 12 was taken from the left bank just above Carter's Ferry, and shows the ledges extending across the river at approximately right angles. It shows the gravel bar about the middle of the river and water worn boulders.

Photograph No. 13 was taken from the same point as Photograph No. 12, that is above Carter's Ferry, and shows in detail one of the main ledges crossing the stream.

Photograph No. 14 was taken from the left bank near Barren Springs. It shows ledges crossing the river and gravel bars in the river.

Photograph No. 15 was taken from the right bank of the river near Barren Springs station and shows the ledges crossing the river.

Photograph No. 16 was taken from the right bank of the river about 1 mile above Big Reed Island, and shows the shallowness of the water, and that is one of the points where it was necessary for the passengers to leave the boat and follow along the bank while the men worked the boat over. There is an indication of ledges on the right hand side of the picture and also gravel bars in the foreground. The boat in the picture is the same boat that we used that day and the same workmen. Big Reed Island is not very far above Allisonia.

Q. I show you photograph No. 17 and ask you where that was taken and what it shows.

A. This photograph was taken three-fourths of a mile above Big Reed Island bridge and shows the ledges and projecting rocks and water worn boulders and the shallow conditions at that time generally.

Photograph No. 18 was taken from the left bank near the gaging station at Allisonia and shows the ledges extending across the river and a few of the projecting rocks and also shows the gaging tower in the upper right hand corner.

Photograph No. 19 was taken from the right bank about ½ mile above Delton and shows the ledges extending across the river. My copy of that picture is not very clear; it looks a little hazy due to the fog. This picture was taken early in the morning and it shows the fog.

2267 Photograph No. 20 was taken from the right bank immediately above Delton and shows a series of ledges crossing the river. There is what appears to be a gap in that ledge, over across towards the right hand side of the picture. I could not say definitely whether that is a channel cut in there by the Government. It is impossible to say.

Photograph No. 21 was taken from the left bank above Delton and shows the ledges crossing the river and the ledge shown on the preceding photograph appears in this one. On this picture it appears on the far side of the upper ledge near the top of the picture.

Photograph No. 22 is a view from the right bank about 1 mile below Clark's Mill, and shows the shallow condition of the stream and our boat being carried across the shallow places—led across. Clark's Mill is just about 4 miles below Allisonia, about a mile and a half below Delton. This picture shows the river from shore to the other shore, all of the river is in the picture.

Photograph No. 23 was taken about 2 miles below Clark's Ferry and shows a large riffle and several other riffles crossing the river

right angles and also shows a boat in the middle of the picture
nd 2 men working the boat over these ledges.

Delton is downstream from Allisonia on the opposite side of the
ream and then Clark's Mill. Hiwassee is between Delton and
llisonia, it is about 1 mile below Allisonia. It is difficult to give
miles how far Delton is below the Hiwassee bridge. I have
ot been up there for so long; probably a mile or a mile and a
lf. Clark's Mill is about a mile and a half or a mile below
elton.

Photograph No. 24 shows the ledges and the rocks projecting
om the water and is at a point 3 miles below Clark's Ferry,
ken from the right bank.

Photograph No. 25 is a view from the right bank about ¼ of a
ile below Owens Ferry, showing the ledges crossing the river
nd some projecting rocks. I don't believe there is any channel
rough that ledge observable in that picture. I don't see
any.

68 Photograph No. 26 is a series of ledges crossing the river,
¾ of a mile approximately below Owens Ferry. There
e several ledges extending all the way across the river.

Photograph No. 27 is a picture taken from the same point as
hotograph No. 26. It shows the same ledges and also shows a
ap in 2 ledges. The gap is probably a part of the river im-
rovements. It is not very deep but is sort of sunken.

Photograph No. 28 was taken from the left bank ¾ of a mile
elow Owens Ferry and also shows the same ledges shown in
e preceding photograph No. 27.

Photograph No. 29 shows more in detail the picture of the
dges taken in the last two or three photographs. In an at-
mpt to show, if possible, any river improvements. At this
oint, we were trying to get in detail the low spot in the ledges.

Owens Ferry is shown on the map to be roughly 4 miles below
lark's Ferry. Owens Ferry is the only name I know; Eanes
erry possibly. I never heard it called Cox's Ferry. Max's
reek comes into New River at Owens Ferry. Haw Branch is
Wheeler Branch Ferry, and Owens Ferry as I recall is at the
outh of Max's Creek.

In photograph No. 29 the sluice that may be the improvement
mentioned is just about in the middle of the picture. That is
rough the upper ledge and right about in the middle of the
cture. The sluice is shown at right angles through the ledges.

Photograph No. 30 was taken from the left bank about ¼ of a
ile below Wheeler Branch Ferry. Wheeler Branch Ferry is
one side and Haw Branch on the other; sometimes they are
lled one and sometimes the other. There is a highway bridge
ere now; and the ferry has been discontinued.

Photograph No. 31 is a view across the river from the left bank showing 2 good sized ledges, ¾ of a mile below Wheeler Branch Ferry, and shows a gap through the ledge in the
2269 foreground, but I believe it is too narrow to indicate any improvement on the river; it is too narrow a gap through the ledge to be a river improvement.

Photograph No. 32 was taken from the same point as photograph No. 31 and shows the ledges of the river taken at a different angle. The gap in the ledge in the middle of the photograph is the same one shown a little to the left of the center in the preceding one.

Photograph No. 33 is a view taken from the left bank, ⅝ of a mile below Wheeler Branch Ferry and shows a series of ledges constituting the falls and the rough condition there. That is not the same part of the river shown in the two preceding photographs. I do not know what that particular falls is called.

Photograph No. 34 is a view upstream from the left bank of the river, about 1 mile above Whitt's Ferry, and shows a series of ledges in the distance and also a view of projecting rocks in the foreground.

Photograph No. 35 is a view up stream from the point in the river ½ a mile above Whitt's Ferry, showing the ledges extending across the river.

Photograph No. 36 is a series of ledges extending across the river; the picture was taken from the left bank and the point is just above Linkous' Ferry. Linkous' Ferry is, I should say 2 or 3 miles, below Whitt's Ferry. Photograph No. 36 shows a series of ledges extending across the river. It also shows the automobiles we used after we left the boat at Whitt's Ferry. That is in the left foreground.

Photograph No. 37 is a view across the river from the left bank and at a point immediately below Whitt's Ferry and shows ledges crossing the breadth of the stream. They are not the same ledges shown in photograph No. 36, these are below the ferry and the preceding photograph was above. They are probably ⅛ of a mile apart.

Photograph No. 38 is a view across the river from the left bank about ⅜ of a mile below Linkous' Ferry, and shows the ledges crossing the river and shows the gravel bars in the middle of the river. There is a low place in the ledge in the immediate foreground. It is impossible to say whether or not it was
2270 man made or nature made, from an observation of the place.

Photograph No. 39 is a view up stream from the left bank, a mile below Linkous' Ferry and shows the ledges across the

stream and an island in the middle of the picture and the beginning of another island on the left-hand side of the photograph.

Photograph No. 40 is a view up stream from a high point about 1 mile below Peak Creek on the left bank, showing a series of ledges crossing the stream at approximately right angles, and also shows a series of islands extending up and down the river. That is about ¼ of a mile below Peaks Creek. The mouth of Peaks Creek is not shown in the picture.

Photograph No. 41 was taken on the left bank of Old No. 6 Site which was about four miles from the present one. It shows the rock ledges crossing the stream—not very much. There appears to be a channel in the middle of the picture, but whether or not it was man made, I don't know. We didn't go through that in a boat—we had no boat there.

Photograph No. 42 was taken from the left bank at Old No. 6 Dam Site and shows the ledges and the upper part of the island, and here too is shown something that appears to be a sluice (indicating). These two views, No. 41 and 42, are views from the left crossing from the left bank. The ledge in photograph No. 41 is not shown in photograph No. 42. The ledge in No. 42 is somewhat below No. 41. Looking at the top of the picture in 41 and No. 42 you will see a cornfield over at the edge of the stream which might identify the location better.

Photograph No. 43 is a view across the river at Ingle's Falls from the left bank, about ½ a mile above Ingle's Ferry. It shows the ledges extending across the stream and the projecting rocks and also shows the water tower of the city of Radford in the left-hand side of the picture, on top of the hill. What is shown there is generally called Ingle's Falls. All of Ingle's Falls is not in this photograph, it extends for quite a distance.

2271 Photograph No. 44 is a picture taken from about the same point but at a different angle and somewhat further away from the river than the preceding photograph. It shows the ledges and the projecting rocks. The ledges and rocks shown in picture No. 44 appear in No. 43, they do partially at least. These two pictures may be oriented by the large rock in the foreground of picture No. 43, which shows on the left side of picture No. 44, right by the trunk of the tree there, right near the water's edge.

Photograph No. 45 is a view from the left bank of Ingle's Ferry at the foot of Ingle's Falls and it shows a view of the projecting rocks and gravel bed or gravel bar, which is in the middle of the river.

Picture No. 46 was taken from the left bank at a point opposite the city of Radford, and shows a very regular ledge extending across the river and shows the Old Radford Furnace, or I think

one of the furnaces at least, on the left side of the picture, and the pipe shop in the right side of the picture. That is above the highway bridge.

Photograph No. 47 is a view taken from the highway bridge crossing the bridge at the city of Radford looking downstream, showing the ledges crossing the stream at right angles.

Photograph No. 48 was taken from the left bank about ½ a mile below Walton and shows the ledges crossing the stream and also the gravel bars.

I would say Walton is about 3 miles by the river from Radford, guessing at it. I think that is pretty close—it is down-stream from the upper part of the horseshoe, that is, the arch. It is up-stream from the tunnel, the bridge and Pepper's Ferry.

Photograph No. 49 was taken from approximately the same point, and shows the ledges crossing the stream, at the same point as in the preceding photograph. It shows the ledges crossing the stream as well as the gravel bars. I believe they are the same ledges in both pictures.

Photograph No. 50 is a view across the river from the left bank, about 10 miles below and shows the shoals and the
2272 water worn boulders and the gravel. I don't know whether these are the Monkey Shoals or not. It is below Walton about 7 miles, I would say 6 or 7 miles below Walton, and 10 miles below Radford. Pictures No. 48 and 49 were taken from the same point; No. 50 was taken 10 miles down from Radford. I would say 7 miles or 6½ or 7 miles, below the point from which No. 48 and 49 were taken.

Photograph No. 51 was taken from about the same point that photograph No. 50 was taken, from the left bank about 10 miles below Radford. They are the same shoals and the same gravel bank in both pictures No. 50 and 51.

Photograph No. 52 was also taken from the same point that photograph No. 50 and photograph No. 51 were taken, and it shows the shoals and the gravel bars.

Photograph No. 53 is a view across the river from the left bank, taken from the Parrott Mining property, showing several series of ledges crossing the stream at right angles. Some of the ledges are submerged and it shows the Norfolk & Western Railroad in the foreground and the Virginian Railroad on the opposite bank. The village across the river is McCoy.

Photograph No. 54 is a view taken up stream from the left bank at the Parrott Mining property and shows the ledges extending across the river in the distance.

Photograph No. 55 is a view taken across the river from the right bank at McCoy railroad station and shows the ledges crossing the river and the projecting rocks and a few small islands

and the Virginian Railroad in the foreground. The ledges on the left hand side of photograph No. 53 may be the ones shown in the photograph No. 55, it is a little indistinct.

Photograph No. 56 is a view from the left bank about ¼ of a mile above Big Falls. It shows a series of ledges crossing the stream and also shows the Norfolk & Western Railroad in the foreground and the Virginian Railroad on the opposite shore.

2273 Photograph No. 57 shows a view of Big Falls from the left bank; it shows the ledges crossing the stream at the Falls and the Norfolk & Western Railroad in the foreground and the Virginian on the opposite shore. The Falls are located on the Pulaski and Giles county line.

Photograph No. 58 is a view taken from the left bank slightly down stream from view shown in photograph No. 57. It shows the Big Falls, the same falls that were shown in No. 57.

Photograph No. 59 is a view from the right bank about ½ a mile above Goodwin's Ferry, and shows the regular ledges extending across the stream at right angles to the stream. There is the Norfolk & Western Railroad in the distance. Goodwin's Ferry is above Eggleston about 2 or 3 miles, I would say.

Photograph No. 60 is a view from the right bank, about a mile above Eggleston; it shows the ledges, the bars in the river, and some shallow places and the Norfolk & Western Railroad on the opposite bank of the river.

The witness on Cross Examination testified as follows:

I was instructed to take the photographs to show the rapids, rocks, and other obstructions in the river. I was given no particular explanation of why I was to take them. I was requested to take photographs of that portion of the river on which I did take them. No one asked me to go down the river as far as Hinton. Apparently there was some reason behind the taking of pictures which would prompt those who asked me to take them. I was their Engineer of construction. I do not recall that they gave me any reason for taking them. I was told to take the photographs.

Q. And what was the instruction that they gave you as to how you were to take them, if any?

A. All I recall is that I was told to take the photographs on a certain stretch of the river, and more particularly the exposed ledges and rapids and shoals and things of that sort.

2274 I just went out and got a photographer, and went up the river and started to photographing. I probably knew that the Appalachian Electric Power Company had filed a bill of complaint against George Otis Smith and other members of the Federal Power Commission prior to the request of me to

take these pictures. I probably thought that these were being taken to be used in a law suit. I was not given the reason. I was told to take them.

The stretch over which I took pictures was much further than six or seven miles. Offhand I would say it was 50 or 60 miles, from Austinville to Eggleston, or maybe a little more.

It would be difficult to say what space down stream the faults or shoals occupied that were photographed. I took the prominent ones—the more outstanding. I did not attempt to get them all; I could not. I just took the most outstanding ones. The photographer used an 8 x 10 camera, I do not know the make, I don't believe he had a magnifying lens on the front of the camera. I have not studied the Craighill report of the number of pools and shoals in this river in the stretch that I took.

Q. You did not attempt to take pools in your pictures?

A. No, I did not.

Q. And, in taking these rocks and shoals, you took as close up as you could?

A. I showed as large detail as I could.

Q. You showed as large detail as you could?

A. Yes.

Q. I believe you stated that the flow was a low flow?

A. Yes, sir.

Q. You know that it was an exceptional low flow?

A. It was below normal flow—much below normal.

Q. Wasn't it at least one-third below low flow—below ordinary low flow?

A. Well, it probably was.

Q. Why did you select the days of the month of 1931 that you did select, namely: The 4th and 5th of November and the 24, 25th and 26th?

2275 A. It was not really left to my discretion. I was called over the telephone and asked to prepare for taking the photographs as soon as possible.

I did not watch for a time when I felt it would be the best time to get as much exposure of rocks in the river as I could. I was asked to take them the latter part of October, as I remember, and by the time I could get the photographer engaged and everything ready, it was the 4th of November. The fact that it was a real low flow at that time was a coincidence. I know that the operation of the Buck Dam was at peak loads and they carried them to get the most out of them. I did not look into the operation of the plant at all. If they were operating on a peak load, it would leave very little water in the river close by. If on the morning of November 4, 1931 the Buck Dam was closed down so that there was no flow, it would take some time for that to be

felt that far down. At the time the first pictures were taken I was about 10 miles from the Buck Dam. I would not want to say what the normal flow is in that stretch of the river. When the Buck plant was closed down along that stretch of the river there would be practically no water in the stream except that which was coming in from the side streams. That would be true a part of the day but I do not know what part of the day it would be.

We had the right number of pictures we wanted in the first days, that is the 4th and 5th of November, but they were not very good as to quality. Some showed too much landscape and not enough detail of the ledges, and for that reason we took some of them over. We could have taken pictures there that would have shown the pools.

The boat I spoke of I called a punt. It is also described as a canoe. I would not say they are in the same class, I have traveled in both. They call them canoes in Virginia. It is not really a canoe. I have never seen a bateau, but I have seen photographs of them. This was a flat bottomed boat, and you could walk around in it. It was 19½ feet long, about 18 inches deep, and drew about 5 inches of water. A person could change seats and walk around from one place to the other in the
2276 boat. This is the common type of boat that is used on the river. I did not see many of these boats as I was going down the river. Different ferries usually have one or two to take foot passengers across instead of taking the big boat. Aside from that, there were very few. They use them at the Radford Dam, to carry men across—two or three of them. We have no boats down there with motors in them. Some of the fishermen run up and down the pool in boats with motors on them. It is quite a long pool, I would say possibly 3 miles. We have ferry boats the same type boat—that we used to build the Coffer Dam. We don't use them for ferry purposes. One of the boats we used there we built; the other was obtained at Radford.

I know that neither of these boats was brought down over Foster Falls nor was brought down from a distance of say eight or ten miles up the river above our project. I don't know how they got the boat up from Radford. I wasn't there. I don't know whether they hauled it up by truck. I don't know. I think that they did. I don't know whether they boated it up.

I have no idea why the company told me to go down as far as Eggleston and to start there taking pictures. I was puzzled myself, but I did not know why it was.

I would say that those pictures are representative of the river, at the time they were taken. We did not try to take the pools.

The pools could be taken. I think it would be representative of the river without the pools. It shows the nature of the river and the character of the river. Knowing there was a stretch between the photographs, there must be some pools between. I do not know whether that is an inference that probably many people would not know necessarily. A great many stretches between those ledges are not pools. They are shoals, projecting ledges and rocks. I think these pictures would be representative of the conditions of that river. It shows the rocks and a rocky and mountainous stream.

I saw indications of something that might have been Government improvement work, but I was unable to say definitely. I know that we tried to get through some with the boat, and especially the one that we took 3 or 4 pictures of at one place, and that seemed to be the most definite. The boat dragged
2277 on the rock, and it was difficult to get it through. It was right in that area where I was told the Government had done work. We did not get out and push the boat through that one, but we had to take the poles and work it through and get the weight off the boat with the poles. The channel was too shallow for the boat to go through. There was not enough water for the boat to go through; the bottom would catch on the rocks. That was on November 5, 1931, along about noon I would say, just before noon I think. That particular spot was just below Owens Ferry about ¾ of a mile. As I could see it, and we were looking at it, it seemed the ledge was not cut deep enough through the rock. There were no channel indications at all. If there was one, it had filled up with debris. It was the rock, and the ledge itself that I was interested in.

On the trip I did not see at any time any rock that I thought had been thrown out on Government work, on that stretch of the river. I was looking for any indication for a channel, or rock cuts, or anything of that sort. I made my own observations. If I had seen any indications I would have taken pictures, but I did not see any. I would not say that there was no work done by the Government on this stretch. If there had been channels, they had probably been filled up with debris. High water probably filled them up. I have read some of the engineer's report in regard to the work done.

I was on the river there for 3 days at one time. During that time there was no noticeable variation in the flow of that stream due to the operation of the Buck and Byllesby dams. I did not see any variation. There may have been some, but it would not be noticeable. There could be a variation without it being perceptible to me as I went along. I was not measuring the stream flow.

I did not see a channel constructed there to the depth of two feet. I saw no channel. The only thing I saw which might have been an improvement was the tops of the ledges cut off in one or two places, and they were not 2½ feet deep.

Q. Do you think these channels which the engineers stated they dug were obliterated by reason of the fact they were filled up?

A. Might have been.

2278 Q. And being filled up with debris they have been obliterated?

A. Yes, sir.

On this trip down the river I had a photographer and 2 men to work the boat. They were familiar with the river, they lived on the river, that is, they had farms adjacent to the river. They did not boat up and down the river and they did not know anything about the channel of the river. None of them had been up and down the river through the channel. We had to find our way down through the ledges. Sometimes we would go back and forth from one side of the river to the other and find no channel, and in a case of that sort, the passengers would get out on the ledges and the 2 men forced the boat across. At that time there was no geological condition to upheave things so, as to put a channel out of existence.

The Parrott Mines are coal mines. An anthracite deposit. It is located across the river from McCoy.

I remember that place shown in Government Exhibit No. 249, which purports to be an aerial photograph of a stretch of New River with Dublin in the distance.

Q. Do you notice certain lines drawn in the body of the river?

A. I do.

Q. Do you notice certain spots going with the flow of the river?

A. Yes, sir.

Q. Do you recognize those as channel work?

A. On our own photograph. I took our photograph from this point.

Q. Up where the trees are?

A. Yes, right up in there [indicating on picture], and while I was going over the river I could not see any indication even after I stood at that point, but after the photograph was developed and printed, one can see an indication down through there of what might have been a channel and rock thrown up along that side of the bank, but it wasn't noticeable looking down.

Q. Do you know where you went when you came down the river?

A. At this place we took the road. You can see the road parallel there.

2279 Q. You were using automobiles there?

A. Yes, sir.

Q. I call your attention to Exhibit #544 and ask you if it isn't a fact that of the sixty pictures you have there, 1 and 2 were taken from approximately the same point?

A. Yes, that is true.

Q. And 3, 4, 5 and 6 covering the same part of the river at Foster Falls?

A. That is true.

Q. And 7 and 8 at Baker's Ledge?

A. They are very close together.

Q. And 9, 10 and 11 at a point about three miles below Foster Falls?

A. Yes.

Q. And 12 and 13 at Carter's Ferry?

A. Yes.

Q. And 14 and 15 at Barren Springs?

A. That is true.

Q. All of those I have called your attention to at this time were above where the Radford pool is located on the river; is that right?

A. Yes, I believe so.

Q. And 16, 17 and 18 were all at Allisonia, were they not?

A. 16 was over a mile above Allisonia.

Q. And 17 and 18 were how close to Allisonia?

A. 17 three-quarters of a mile above Allisonia and 18 was practically at Allisonia.

Q. So they were all within an area of about a mile?

A. About a mile.

Q. 19, 20 and 21 were all at Delton, were they not?

A. Yes.

Q. And 22 and 23 were at Clark's Ferry?

A. 22 was a mile below Clark's Mill; 23 is about two miles below.

2280 Q. A mile apart?

A. Yes.

Q. And 26, 27, 28, and 29 were about together, and three-quarters of a mile below Owen's Ferry?

A. Yes, they are meant to show the same point.

Q. What is photograph 30?

A. View from left bank, one-fourth mile below Wheeler Branch Ferry.

Q. 30, 31, 32 and 33 are within an area of about a quarter of a mile or three-eights of a mile?

A. Yes, I would say so.

Q. 34 and 35 are close together too, are they not?
A. Yes, about a half mile apart.
Q. And they are close to which ferry?
A. About a mile from Whitt's Ferry.
Q. And 36 and 37?
A. Very close together.
Q. Near Linkous's Ferry?
A. Yes.
Q. 36, 37, 38 and 39 are all close together?
A. Well, yes, within probably a mile.
Q. Then 40, 41, and 42 are at the same point, are they not?
A. No, no, they are very widely separated.
Q. What is 41?
A. 41 is the view of the old #6 dam site about 4 miles above new #6.
Q. What is #42?
A. Very close to 41, practically the same location.
Q. 44 and 45 are very close together?
A. Yes, sir.
Q. And 46, 48, and 49 were taken at the same point, were they not?
A. They are taken at the same point.
Q. 50, 51 and 52 are also taken at the same point, are they not?
A. Yes.
Q. 53, 54, 55, and 56 are all taken at McCoy's Ferry, are they not, at Sifford's Falls?
A. Well they are taken along a stretch of a mile or so. I would say maybe a mile and a half.
Q. How close are 57, 58 and 59 to each other?
A. 57 and 58 are taken practically at the same point, and 59 is a considerable distance downstream. I have forgotten just how far.
Q. It is a fact, is it not, that the shallows or shoals which you have taken photos of cover only seven miles out of the sixty-seven miles on the stretch which you covered by boat or cover in your photographs?
A. Yes.
Q. So the remaining sixty miles of the sixty-seven would be pools?
A. Not necessarily, no. It is impossible to take pools, the water might be only a few inches deep, and you could not show it in the picture, and many of the le'ges were so insignificant they would not show in a photograph, but there are not many what you would call pools.
Q. Wasn't it quietly flowing water in these stretches and not what you would call rapids?

A. Some places it was only a few inches deep and one stretch the ledges ran parallel to the river, and it was rough, you could not get around, you just could get through to get down the river, but could not show it in a photograph.

Q. How often have you been up to Allisonia and that part of the country?

A. A great many times.

Q. You have seen those rock, most of the rocks, covered by the water many times, have you not?

A. I have seen them covered, yes, sir.

Q. And if there was a flow down there say of three or four thousand feet, wouldn't they be covered most of the time?

A. Probably be covered, but still there would be obstructions and difficult to get anything over them.

2282 Q. The water under such conditions would be several feet deeper than when these pictures were made?

A. Deeper and more turbulent and more dangerous.

Q. Have you been informed that the U. S. Government sent a motor boat all the way up from Allisonia and back this year?

A. I have heard it rumored.

Q. You didn't know that to be a fact?

A. No.

Q. It has been testified to in court, but you didn't know about that?

A. No.

(Exhibit 249, being photograph No. 35 contained in album of aerial photographs of New River—Exhibit 273, was offered in evidence over Defendant's objection that said exhibit had not been properly proved.)

T. A. PATTON on Direct Examination testified as follows:

I live at Roncefort, West Virginia. I am a photographer. I have been a photographer since 1884. I was a photographer in September, 1930. I recall taking some pictures on the New River during that month of September. I took the photographs No. 114 to 127 inclusive, contained in Defendant's Exhibit 555, which exhibit also contains a map showing the location of photographs 114 to 127 inclusive. I took these pictures on September 29, 1930.

Q. Do those photographs fairly portray what is shown in them as to the time and place at which they were taken, as indicated at the bottom of the photograph?

A. Yes, sir.

By Mr. ABBOT. If Your Honor please, we offer Defendant's Exhibit 555 in evidence. This location map is offered simply with reference to the location of the different photographs and not as any evidence of State or County lines or anything of that kind.

(Said album containing 14 photographs of views on New River
om Wiley's Falls to Mouth of Greenbrier River, Nos. 114 to
, inclusive, and the location map, is here filed and is marked
"Defendant's Exhibit 555.")

33 The witness on Cross Examination testified as follows:

I was not given any instruction when I took these pic-
es. I went with an engineer employed by the Appalachian
ectric Power Company to make these pictures. The engineer
s Mr. Rader. He gave no instructions at all except just to take
tures that he pointed out. He went along with me. The first
ture shows the entire width of the river. It is an up-view of it,
t it takes a full view.

(It was agreed by counsel for the plaintiff that photograph No.
1 in Defendant's Exhibit 555 was the same photograph which
fendant offered and had marked for identification as "Exhibit
.")

On the left-hand side of the picture there appears to be a body
water that disappears behind some trees. There is no island
re as I know of, I don't think so, I did not notice any. It is
t back water. That is looking up stream. It is over on the
e of the stream and there might be an eddy there, I don't
ow, I couldn't say just what that water is there. I don't remem-
seeing any island there. I used an Eastmans 8 x 10 camera.
id not have any enlarging lens on the front, it was just a regu-
Eastman kodak lens. I took this picture from the bank of the
er. There is no island in picture 115, in the background. I
ld not describe those pictures no more than to say I made them
der orders. All I did was to do the camera work. I paid no
ention to anything else except just the operation of the camera.

Q. Was the river very low at that time?
A. It wasn't very high.
Q. Would you say it was low?
A. Yes, sir, it was low.
Q. You don't know just exactly how low?
A. No, sir.
Q. Wouldn't this indicate on picture 115, that it was extremely
w?
A. That was the first trip I took up the river, I am not familiar
with the river, and I didn't pay any attention to that.

34 I did not know any places that I was going to up the
river. I know nothing about this matter except that I took
some pictures, I can vouch for the pictures, and that is all.

35 (Exhibit 556, being the Annual Report of the President
and Directors of the Board of Public Words to the Gen-
l Assembly of Virginia in pursuance of an Act entitled "An

Act creating a fund for internal improvements" was offered in evidence.)

(Exhibits 558A–G, inclusive, being a map—in 7 sheets—accompanying F. W. Alstaetter's report of November 21, 1912, bearing legend, "New River from Hinton, West Virginia, to Radford, Virginia, compiled under direction of Major F. W. Alstaetter, Corps of Engineers, U. S. A. from surveys by Engineering Department in 1872 and by United States Geological Survey in 1884–5–6 & 7" were offered in evidence—Exhibit 558G being the same as Exhibit 527 marked for identification.)

(Exhibit 559, being pp. 95, 133–139, inclusive, of Report of the Chief of Engineers, for 1875, was offered in evidence.)

(Exhibit 528, being the full and complete report from Major Craighill, U. S. Engineer's Office, Baltimore, Md., dated April 17, 1891, to Chief of Engineers, T. L. Casey—said report contains in particular the paragraph of Major Craighill's report which was omitted from Exhibit 43 as originally offered by plaintiff—together with Chief of Engineer's endorsement dated April 21 1891, was offered in evidence.)

(Exhibit 560, being pp. 251–253 and 1925–1929, inclusive, of the Report of the Chief of Engineers for the year 1887, relating to New River, was offered in evidence.).

(Exhibit 561, being pp. 225, 226, 1760, 1761 of the Report of the Chief of Engineers for the year 1888, was offered in evidence.)

(Exhibit 562, being pp. 261, 262, 1961, 1962 of the Report of the Chief of Engineers for the year 1889, was offered in evidence.)

(Exhibit 563, being pp. 235, 236, 2249–51, inclusive, of the Report of the Chief of Engineers for the year 1890, was offered in evidence.)

(Exhibit 564, being report of Brig. Gen. Casey, Chief of Engineers, U. S. Army, to the Secretary of War, dated November 16, 1894, to which is attached a third endorsement by Colonel Craighill, and also a second endorsement, was offered in evidence.)

(Exhibit 565, being a letter from the Secretary of War, dated December 16, 1903, transmitting with a report from the Chief of Engineers, dated December 1, 1903, a report on the Examination of New River, West Va., by Captain W. E. Craighill, dated February 4, 1903, was offered in evidence.)

(Exhibit 566, being a memorandum to the Secretary of War by General Black, Chief of Engineers, dated May 19, 1916, on "Pollution of the Waters of New River and its effluent, the Kanawha River, by the flowing of ore washings from the mines and furnaces located on the former river and its tributaries" was offered in evidence.)

(Exhibit 567, being page 1284 of the report of the Chief of Engineers, year 1917, was offered in evidence.)

2286 RUFUS W. PUTNAM

Direct Examination By Mr. JACKSON:

Q. Please state your full name and residence for the record?
A. Rufus W. Putnam; Riverside, Illinois.
Q. And that is a suburb of Chicago?
A. That is a suburb of Chicago.
Q. What is your present occupation?
A. I am a consulting engineer.
Q. And where is your office?
A. My office is located in Chicago, 20 North Wacker Drive.
Q. Where were you educated?
A. I was educated in high school, and later at United States Military Academy, West Point, graduating from there number nine in my class into the Corps of Engineers.

By Mr. THOMPSON:

Q. What year?
A. 1913.
Subsequently I attended the Army Engineers School at Washington Barracks, D. C., from the Fall of 1914 to late Spring or early Summer of 1916.

By Mr. JACKSON:

Q. You say you were commissioned in the Engineers Corps after graduation from West Point?
A. Yes; I was.
Q. What was the character of the studies you pursued at the Army Engineers School, Washington Barracks?
A. The course consisted of approximately 50 percent river and harbor engineering, and the balance of the course was devoted to mechanical and electrical and other phases of civil and military engineering.
Q. Did your work in the Army Engineers School, so far as related to river and harbor navigation, involve field inspection and work of that character?
2287 A. These courses did. I recall particularly two field inspection trips where river and harbor improvements were going on. One was over the Monongahela River and the other over the Ohio River.
Q. Major, will you please state generally what has been your experience in the practice of your profession since your graduation from West Point?
A. After graduating from the United States Military Academy, I served, except for the period previously described in the Army Engineers School, almost entirely with troops both in the United States and in France until June 1921. At that time I was

assigned to duty in Chicago as Assistant to the United States District Engineer, which position I held for a year, and then was appointed U. S. District Engineer for the Chicago District.

Q. What waterways in general were under the jurisdiction of the United States Engineering Office for the Chicago District?

A. At that time the Chicago District included the harbors on Lack Michigan from Waukegan, Illinois, in the north, and, taking them in order, from there on around, the harbor of Chicago, South Chicago, Indiana harbor, supervision over the private harbors of Buffington and Gary and the public harbor at Michigan, Indiana; the Chicago and Calumet Rivers and their branches, the Indiana Harbor Ship Canal, what is known as Trail Creek at Michigan City, Indiana, the Chicago Drainage Canal, Calumet Sag Canal, the Illinois River from the head of the Federal Improvements near LaSalle, Illinois, about 100 miles out of Chicago, to the mouth of the Illinois River where it joins the Mississippi at Grafton.

Q. How long were you in charge of the Chicago District?

A. Four years.

Q. During that tour of duty, in charge of the United States Engineering Office of the Chicago District, did your duties involve studies of reports upon the condition of improvement of any of the rivers or streams in that district?

2288 A. These did include several streams and harbors in the district. The principal one had to do with the further improvement of the Illinois River to tie in with the improvement being undertaken by the State of Illinois between the head of the Federal improvement and the Chicago Drainage Canal.

Q. Did this study and report on the Illinois River involve any consideration of traffic possibilities?

A. It did. My office was asked to make recommendations with regard to the future improvement of this stream, and it appeared that the expenditure of a considerable sum of money would be involved, so that, in order to determine whether this improvement was justified, or not, it was necessary to make a very complete traffic survey.

We examined the methods of water transportation on the Illinois River and Mississippi and elsewhere in the United States and determined what traffic might be available to the waterway, and from that we were able to consider the possible saving to the public by reason of any proposed method of improvement.

Q. Was your report on the Illinois River ever published?

A. It was subsequently published as a part of House Document No. 4, 69th Congress, First Session.

Q. Major, during your tour of duty in charge of the United States District Engineers' Office at Chicago, did you have oc-

casion to study and consider the effect of large variations of flow and diversion of water from Lake Michigan through the Illinois waterway into Illinois River?

A. I did.

Q. Did that study involve substantial changes in the amount of flow or otherwise?

A. It involved substantial changes in the water of perhaps two to six thousand second-feet.

2289 Q. Now, will you please continue the statement of your professional experience after you finished your tour of duty in charge of the United States Engineering Office for the Chicago District?

A. When I finished that assignment, I had been assigned as United States District Engineer at Honolulu, and, at the same time, I had been requested by the Commercial Club of Chicago to make a study and report on the requirements of the Chicago Metropolitan District in the way of harbor and waterway improvements, and, as the result of this request on the part of the Commercial Club, I resigned from the service of the United States Army and undertook this work.

Q. That was when?

A. This was in 1926.

Q. Now, what did you do first after you entered upon that work?

A. I first went to Europe and spent some time there in the study of harbor and waterway improvements and traffic arrangements, including among the waterways the Seine and Rome Rivers in France; the Elbe and Rhone Rivers; and the Thames, I believe, in England.

After that I returned to the United States and spent some more time studying harbor and waterway improvements along the Atlantic Coast and the Gulf Coast, as well as along the Great Lakes, including inspection trips on the Mississippi River from Cairo to New Orleans, and one on the New York State Barge Canal between Oswego and Albany.

That particular work for the Commercial Club was completed in 1927, and, at that time, I had already begun to practice as a Consulting Engineer on river and harbor works.

Since then I have handled some 60 different projects in various parts of the country.

Q. Do you mean river and harbor projects?

A. River and harbor projects. Among these I might mention specifically the design and supervision of construction of the harbor and terminal for a stone company near Manistique, Michigan; harbor and waterway improvements near the

2290 mouth of the Rio Grande River in South Texas; some work

on the Houston Ship Canal, studies of the Ohio and upper Mississippi River with regard to the development of water transportation operations; a study for the same purpose, about the year 1930, of the Kanawha River, and, in addition to that, various projects which included the development of harbors and terminals at various locations.

Q. Have you, in recent years, had any connection with any company engaged in the navigation business?

A. I have. Since 1928 I have been an officer and stockholder in a navigation company which has been engaged in the transportation of bulk commodities on the Chicago Drainage Canal, Chicago River, Calumet River, and the harbors in the southern end of Lake Michigan.

During one season we operated a fleet of barges on the Illinois River, bringing coal into Chicago from a point about 200 miles south.

I have devoted about 25 percent of my time since 1928 to the affairs of that company.

Q. Have you had any other connection with the active management of navigation operations?

A. I have. In 1930 I was in active charge of an operation involving the transportation of coal by barges on the lower end of the Green River to Evansville, Indiana.

Q. Are you a member of any professional society?

A. A member of the American Society of Civil Engineers, the Society of American Military Engineers, and I am a past president of the Western Society of Engineers.

Q. Have you written any technical papers dealing with navigation problems?

A. I have written quite a few on this subject, one of which received the Wellington award of the American Society of Civil Engineers.

By Mr. THOMPSON:

Q. When you say "this subject," what subject?

2291 A. Water transportation.

By Mr. JACKSON:

Q. Major, have you made any special study on the New and Kanawha Rivers?

A. I have made a special study on the New and Kanawha Rivers.

Q. In the course of that study, have you made any study of the reports, maps, and records of the United States Army Engineers dealing with the New River and the Kanawha River?

A. I have.

Q. Will you please state briefly what records, maps, and reports of the United States Army Engineers you have in general examined in the course of your study of the New River and the Kanawha River?

Mr. THOMPSON. May I ask the witness what he is reading from?

A. I am reading from notes I have prepared. For instance, right here I have a complete list of the various documents I have examined. There are so many, I couldn't possibly remember them all.

Mr. THOMPSON. All right.

A. I am not sure I understood that question, Mr. Jackson. Reports of Government Engineers?

Q. Any reports or maps of Government Engineers you have studied in your special study of the New and Kanawha Rivers—Government Engineers or early engineering surveys?

A. I studied the following in that connection: The Moore & Briggs Survey of 1819; Report of the Commission headed by Chief Justice Marshall in 1812; Map accompanying John Marshall Report, entitled A Survey of the Headwaters of the James River and the Greenbrier and Jackson Rivers and the great Kanawha or New River, and the high road between them; Annual Reports of the Chief of Engineers from 1873 to 1891, inclusive, which include the reports of the Chief of Engineers, the District Engineer and his local subordinates dealing with New River; photostats of originals of 35 maps, purporting
2292 to be a part of the New River surveys made by Government Engineers between 1872 and 1878.

Q. Is that the map offered by the Government as Exhibit 190, do you know?

A. That is what I understand. Also various profiles of New River accompanying these reports. I have examined later reports of the Chief of Engineers and also the extracts from the River and Harbor Act of June 13, 1902, with reference to the discontinuance of the New River project.

The report of Major F. W. Alstaetter, District Engineer in 1912, with reference to the improvement from Radford to Hinton. That is known as House Document No. 1410, 62nd Congress, Third Session.

In regard to these foregoing reports, I have examined the reports of the Review Officers, including those of the Chief of Engineers and the Secretary of War.

I have examined Executive Document, House of Representatives, No. 110, 41st Congress, Third Session, containing reports of the Secretary of War, Chief of Engineers, and Major Craighill, covering a survey conducted in 1870 and 1871 on the James River and Kanawha Canal.

Also the Annual Report of the Chief of Engineers for the year 1873, containing a report of an additional survey of the James River and the Kanawha Canal.

A report of the Special Board of United States Engineers on the James River and Kanawha Canal, in 1874.

An extract from the Annual Report of Chief of Engineers, 1875, concerning additional surveys on the James River and Kanawha Canal.

Also what is known as the 308 Report on the Kanawha River and its tributaries, known as House Document 91, 74th Congress, First Session.

Also House Document No. 190, 70th Congress, First Session, being a report by Major Ardery and his reviewing officers on the improvement of the Kanawha River.

2293 Also House Document No. 31, 73rd Congress, First Session, being a report by Major Herman and his reviewing officers on improvement of Kanawha River.

Q. Major, do the reports of the District Engineer and his subordinates, or at least some of them, during the period 1873-1891, and the report of Major Alstaetter, 1912, refer to certain maps not published with the reports?

A. They do.

Q. Did you examine those unpublished maps?

A. I have, so far as they have been made available to me, and I understand all obtainable maps have been made available.

Q. In particular, have you examined the unpublished map and profiles which accompanied Major Alstaetter's Report of 1912?

A. I have examined those.

Q. Have you examined the maps of United States Geological Survey covering New and Kanawha Rivers?

A. I have.

Q. Will you state particularly whether you studied and examined the reports of the Mile-by-Mile Survey of the 128 mile stretch of New River extending from the Lead Mines to the mouth of Greenbrier, as set forth in the report of Major Craighill, and in the attached report accompanying it of N. H. Putnam, both appearing in the annual report of the Chief of Engineers 1873?

A. I have.

Q. Will you also please state in particular whether you examined the report of the mile-by-mile survey of New River from the mouth of Wilson Creek to the Lead Mines, as it appears in Report of Major Craighill, and the separate reports of his subordinates Capt. Cuyler and Mr. Scott, all appearing in the report of the Chief of Engineers 1879?

A. I have examined all.

2294 Q. Please state in particular whether you examined the Mile-by-Mile Survey contained in the Moore & Briggs Report of 1819?

A. I examined that also.

Q. Have you personally inspected or examined the New and Kanawha Rivers?

A. I have.

Q. Will you please state generally the nature and extent of your examination of the New and Kanawha Rivers?

A. About the year 1930, on behalf of the navigation company in which I was and still am interested, I made an examination of the Kanawha River with a view to the possibility of transporting coal from that district by water to St. Louis. That examination had to do with the navigation facilities existing on the stream at that time, including some of the coal loading facilities.

More recently I made an inspection of the New River between points on each of its forks in North Carolina to its mouth, and of the Kanawha River from the junction of the New and Gauley Rivers to its mouth, and included that section of the Ohio River between the mouth of the Kanawha and the lock and dam now under construction at Gallipolis.

This inspection was made by automobile, but at many points I found it desirable to get out and make closer inspections on foot.

Q. Major, will you please describe the physical characteristics of New River as you found them from your study of the early engineering reports, the Mile-by-Mile Survey, and your personal inspection of the river?

A. New River is a stream of comparatively steep slopes, flowing down between stable banks in general, which are fairly steep and high in most places.

There are not many places along New River where you will find bottom lands over which the river can spread out in times of flood.

There seems to be some difference in the characteristics as far as the banks and uplands are concerned, in the upper sec-
2295 tion as compared with the lower, having in mind that from, perhaps, in the neighborhood of McCoy or opposite Parrott's Mine these characteristics change.

Up-stream of that location we find the river flowing in general between uplands which do not extend to comparatively great heights, and the presence of more bottom lands in that section than further on down.

Below McCoy, the river begins to assume gorge characteristics, the banks are more steep and rise in many cases directly

into mountains. There are fewer bottom lands, and while there are stretches where the characteristics described for the upper section seem to apply, in general more and more the river assumes the characteristics of a stream flowing through a gorge, and below Hinton, down to the mouth of the river, the gorge characteristics are almost continuous.

Q. What is the character of the bed of the stream?

A. The bed of the stream in general is rocky, composed of either ledge rock in place, or in some places shoals and gravel and boulders and fixed rocks.

Q. What is the relation of the flow of the stream to the Allegheny Mountains?

A. Below the point I mentioned a little while ago, below McCoy, where the characteristics begin to change a bit, at that location is where the river begins to cut through the Alleghany Mountains towards its mouth.

Q. At low water, what are the characteristics of the stream with reference to the condition of pools and the like?

A. The river at low water seems to be a succession of short pools, interrupted at irregular and frequent intervals by ledges and rocks, boulders and other similar obstructions.

Q. Major Putnam, please state whether or not, in your opinion, New River, in its natural and ordinary condition, was susceptible of practical use by boats carrying any substantial cargo, trade or commerce?

Objection. Sustained.

By Mr. JACKSON:

Q. Please state whether, in your opinion, New River, in its natural and ordinary condition, was susceptible of use by boats?

Mr. THOMPSON. I object to that. That calls for the conclusion of the witness also.

The COURT. There is a great deal of latitude as to the use of boats.

Mr. THOMPSON. Didn't we put that same question to Mr. McWhorter and it was refused?

Mr. JACKSON. We will settle it by asking this question.

Q. (By Mr. Jackson.) Major Putnam, will you please state whether or not in your opinion, New River, in its natural condition, was susceptible of navigation?

Mr. THOMPSON. I object to that.

Mr. JACKSON. That happened to be the form of question which Col. Watkins was permitted to answer over my objection at page 2616 of the record.

Mr. THOMPSON. Please read it.

Mr. JACKSON (reading): "Mr. Watkins, will you state whether or not, in your opinion, New River is susceptible of navigation in its natural state?" I said "We object to that question because it calls for a conclusion," and the Court overruled the objection and the defendant by counsel excepted for the reasons stated.

I would like to have an exception noted on the record to the sustaining of the objections to the questions which I have heretofore asked.

The COURT. If I admitted the question in that form before, he can answer it.

By Mr. JACKSON:

2296 Q. Will you state whether or not in your opinion New River was susceptible of navigation in its natural state?

A. In my opinion it was not.

Q. Will you please state the reasons for your opinion?

A. In my opinion, as shown by the Mile-by-Mile Surveys, New River was a succession of comparatively short pools, interrupted by rapids and shoals and falls. These rapids, shoals, and falls were composed of ledges, fixed rocks, loose boulders and gravel beds, and were of such a nature and so frequent that in my opinion the river could not have been navigable. The surveys show that in some locations chutes existed, through which the main flow of the river proceeded, but the——

The COURT (interposing). Let me interrupt you. Were those chutes artificially created?

A. No, sir. I am talking about the natural passage for the main flow of the stream before the artificial creation.

The COURT. I thought he meant the present condition.

Mr. JACKSON. I intended to ask about the present condition later.

WITNESS. Where these natural chutes existed, the course in general was tortuous and of such nature as to make navigation not only difficult but hazardous. The same conditions were possibly even more serious as to obstacles, and hazards, in my opinion, even when the river was at higher stages than might have prevailed during the time when these Mile-by-Mile Surveys were made.

This, in my opinion, is due to the fact that, with increased stages, the velocity of the stream increases to a certain extent; some of the exposed obstructions to navigation become wholly or partially concealed, and the combination of those circumstances (that is increased current velocity), with partially or completely submerged obstacles, would make the navigation of the sections where these conditions exist equally, if not more, difficult than at lower stages.

Another point I have in mind in reaching this conclu-
2297 sion is that in some places, which is characteristic of streams of this character, the main flow of the water hugs the outside of the bend and in some situations we find along the outside of the bends rocky cliffs against which it would be rather serious for boats to strike.

Furthermore, as the result of the Mile-by-Mile Surveys, the War Department Engineers made reports to Congress stating that in order to attempt to make certain sections of the river susceptible to use by boats, it would be necessary to spend what was then a substantial sum of money with the idea of providing a channel of the least depth of two feet through a great many critical locations.

Q. In your opinion could small boats have moved about the pools in the river?

A. Oh yes, they could have in several places, and I would say that they could get, in occasional instances, from one pool to another, but based on the facts as drawn out by the mile by mile surveys, which I have referred to, such cases could not have been continuous, or regular, but quite to the contrary, and certainly in my estimation accompanied by a considerable degree of hazard.

Q. Now, Major Putnam, will you state whether or not, in your opinion, New River, in its present state, is susceptible of navigation?

By Mr. THOMPSON. I object to that question as calling for a conclusion. He has not been on the river, or at least hasn't so stated, to know whether there is navigation on there. It seems to me the question calls for a conclusion.

By the COURT. I think it is the form of question I permitted before—it apparently is.

By Mr. THOMPSON. Exception.

A. In my opinion New River is not susceptible of navigation in its present state. This is based on the fact that my examination of the river itself, and the more recent reports of the officers having to do with reporting on the New River for the purpose of navigation——[interrupted].

2298 By Mr. THOMPSON. What reports—you said more recent reports? What dates?

By the WITNESS. I think up to the neighborhood of 1925, as I recall.

A. (Continuing) That the changes which have occurred since the early mile by mile surveys were made have been insufficient to have any material effect upon either improving the conditions as to navigability or upon the question of making conditions more adverse.

Q. Major Putnam, in your opinion, would it be economically practical to develop and improve New River artificially, so as to provide a useful channel for three foot navigation?

A. It would not be.

Q. Will you give the reason for your answer?

By Mr. THOMPSON. We except to all this line of testimony.

By Mr. JACKSON. I think it is perhaps irrelevant, but it meets what you offered, and what was admitted over my objection as to its relevancy.

A. In the first place I do not believe that three foot navigation as such could in itself compete with other methods of transportation available to the territory at the present time; and over and above that, I do not see from my examination of the territory, and of the possible commerce that might be available to such an improvement, that there would be enough commerce likely to make use of such a route to justify any expenditures involved.

Q. As a matter of engineering, state whether the improvement of New River so as to provide three foot navigation would require the construction of locks and dams?

A. Assuming that three foot navigation meant three feet below extreme low water, such improvement would, in my judgment, require the use of locks and dams at certain critical locations.

Q. Would it be possible, in your judgment, to improve New River so as to provide nine foot navigation?

A. I think it would be possible.

Q. In your opinion, what would be the approximate cost of improving New River so as to provide nine foot navigation?

A. From the mouth of the New River to the mouth of Wilson Creek, a rough estimate of cost for a nine foot channel
2299 would be in excess of two hundred million dollars.

Q. That would be a slack water system?

A. That would necessarily be a slack water system.

Q. In your opinion would the improvement of New River to provide nine foot navigation be economically feasible?

A. It would not.

Q. Will you state briefly the basis of your opinion?

A. As I see it, the mere annual carrying cost alone of the investment required, plus such maintenance cost as would be involved in keeping up the structures and plus operating costs at the locks and dams, would amount to a sum well in excess of what any anticipated savings through the use of the river by navigation could be.

2300 Q. In a Government project like the one for the improvement of the Kanawha River, or rather by dams and slack

water pools, from what elevation is the project depth in the upper end of the pool measured and maintained?

A. It is measured and maintained below the elevation corresponding to a level pool.

Q. Major Putnam, referring to the conditions at or in the neighborhood of mile 90.5 on the Kanawha River, which the evidence shows to be the head of navigation of Government project in the London pool, at what discharge of the stream would the velocity of current become so great as to affect navigation adversely?

A. I would say it would be between 20,000 and 25,000 cubic feet per second, depending upon the elevation of that particular pool.

Q. In your opinion what, if any, difference would the rate at which the stage or discharge increased from some lesser amount up to this maximum discharge make?

A. It makes no difference to navigation what the rate is, as long as this maximum is not exceeded.

Q. Referring again to the portion of the London pool downstream from the official head of navigation project at mile 90.5 on the Kanawha River, would there be any adverse effect on navigation if there were a decrease in inflow at a rate not exceeding 2,000 second feet per hour, providing the inflow did not become less than that necessary to keep the London pool substantially at the minimum project elevation?

A. There would be no adverse effect on navigation.

Q. Major Putnam, in your opinion what, if any, adverse effect on navigation would result from an increase in stage at the head of the Marmet pool, at a rate not exceeding 1½ feet per hour?

2301 A. There would be no adverse effect upon navigation if the rate of increase in stage did not exceed 1½ feet per hour up to a point where a critical discharge of 22,000 second feet or more obtained, at which point it is possible current velocities would be such as to begin to interfere with navigation.

Q. Would that effect depend upon the rate of increase to that flow or upon the existence of the flow regardless of the rate?

A. It is the existence of the flow entirely.

Q. Please state, in your opinion, what if any adverse effect on navigation would result from an increase in stream flow at the head of the Marmet pool at a rate not exceeding 6,000 second feet per hour?

Q. Major, in your opinion, what if any effect upon navigation would result from an increase in stream flow at the head of the Marmet pool at a rate not exceeding 6,000 second feet per hour?

A. There would be two effects under these conditions; one would have to do with the possible reaching of a critical velocity

which would be reached in the vicinity of 22,000 cubic feet per second, and the other would have to do with an increase in stage at the loading terminals where the relationship of the barge to the loading tipple would change as the stage increased.

Q. Would there be any adverse effect on navigation in your opinion?

A. There would be no adverse effect on navigation as long as this 6,000 second foot increase in stream flow did not produce a total in excess of the neighborhood of 22,000 second feet.

Q. And would any adverse effect at 22,000 feet depend——[interrupted].

Q. Would any adverse effect you have mentioned at 22,000 second feet depend upon the rate of increase in inflow or
2302 upon any other circumstances?

A. It would depend solely upon the current velocity as produced and not upon the rate of increase.

Q. Major Putnam, in your opinion what, if any, effect upon navigation in the Marmet pool would result from a decrease in stage at the head of the Marmet pool for not more than two hours at a rate not exceeding 1½ feet per hour.

A. The rate of change in stage would have no effect on navigation, adverse or otherwise, except the necessary adjustments to lines and spars where boats are tied up at the terminals, so long as this rate did not continue to a point where the pool was no longer maintained at its project elevation.

Q. Can you explain more fully what you mean by the last statement?

A. By that I mean this rate of decrease should not go on to a point where the flow remaining would be less than that necessary to take care of lockage, leakage and evaporation, and the draft through the power house.

There is another qualification I would like to make on that, and that is this is subject to the condition the roller gates are closed, and also subject to the qualification that I would assume under the conditions as I described them, that boats were not loaded beyond the drafts coming within the project depths, and furthermore, that barges were inside the limits of the channel, wherever it might be, of project depth.

Q. Now, Major Putnam, in your opinion what, if any, effect upon navigation in the Marmet pool would result from a decrease in stage at the head of the Marmet pool for not more than two hours at a rate not exceeding 6,000 second feet per hour?

A. The same limitation——[interrupted].

A. The same limitation would apply, and I believe I could very well clear up the point right here, and that is this, that as far as rate of increase or decrease is concerned, or as far

as the rate of increase is concerned, there is only one
2303 limitation, and that is when the current velocities of the stream become obstructive. The rate of decrease and the total decrease is limited at the lower end by the maintenance of pool levels.

Q. Major, in the case of the Marmet pool, what if any effect upon navigation would result from variations in flow in the amount of 2,500 second feet upward and downward from the prevailing average flow?

A. You mean the average flow at the particular time?

Q. That is right.

A. There would be no material effect one way or the other as far as the variation in flow in the amount of 2,500 second feet is concerned, as long as the pool level is maintained. [Interrupted.]

A. (Continuing.) I will modify that to state that as long as pool levels are not below those required by the project. If, for instance, the discharge of the stream at any particular time is comparatively low a reduction or increase of 2,500 second feet will not be material. If the discharge gets high enough so we are approaching one of the critical discharges I described the percentage by which the velocity of flow is either increased or decreased is comparatively small, as for instance we have a total discharge in the stream of around 22,000 second feet, an increase or reduction of 2,500 second feet is in the order of change of 10% in the current velocity on the average. If you get still higher velocities the percentage of change is less and from the point of view of navigation is imperceptible.

By Mr. JACKSON:

Q. Major, in your opinion, what, if any, effect upon navigation would result from increase in stage at the head of Winfield pool at a rate not exceeding two feet per hour?

2304 A. The rate would have no effect until the discharge had reached 30,000 second feet. At that point, or in the vicinity of that discharge, the current velocities begin to become what I would term obstructive.

Q. In your opinion is that condition dependent upon rate of increase by which 30,000 second feet flow would be obtained?

A. No, sir, the rate has nothing to do with it. It is the total flow that produces current velocity.

Q. Major, assuming the maximum discharge, not exceeding 30,000 second feet, what, if any, effect upon navigation would result from an increase in stream flow at the head of Winfield pool at a rate not exceeding 6,000 second feet per hour?

A. As long as the maximum discharge did not exceed 30,000 second feet, the rate of increase is immaterial.

Q. In your opinion, what, if any effect upon navigation, would result from a decrease in stage at the head of Winfield pool for not more than two hours at a rate not exceeding two feet per hour?

A. There again we have the same condition as to the necessity of limiting reductions to a point where the pool is maintained at project elevation.

Q. What does that require?

A. That requires enough flow coming into the pool to take care of lockage, leakage and evaporation and draft at the proposed power plant, and as long as that is taken care of and as long, as I said in the other case, boats are not overloaded and keep within channel the rate of reduction has no material effect one way or the other on navigation.

Q. In the case of Winfield pool, what, if any, effect upon navigation would result from variations in flow to an amount of 2,500 second feet upward and downward from the prevailing average flow?

A. The effect on navigation of a variation of 2,500 second feet between the upper and lower limits I have referred
2305 to previously, one the critical velocity and the other maintenance of pool level, a variation of 2,500 second feet will have no material effect on navigation. As I illustrated before, when the discharge is high the percentage of change in current velocity is relatively low, so it is not appreciable. If the discharge is low, the discharge itself does not produce current velocities having any substantial effect on navigation.

By the COURT:

Q. Are you stating that as a general proposition or does it apply to the Winfield pool?

A. That will apply to any pool ordinarily on the Kanawha River.

Q. Are you applying that statement only to the Kanawha River, and to the particular physical characteristics there?

A. Yes.

Q. It would not be true if you had a very narrow channel something in the form of a canal, which would increase the flow and might have a considerable difference.

A. Yes, if you produce destructive cross-currents and things of that character.

Q. It would increase the level, wouldn't it?

A. Yes, sir.

Q. You made a statement and I was wondering if you meant it to be a general statement or to apply to the physical characteristics there present on the Kanawha?

A. The latter is true because I have examined the cross-section of the stream and applied it accordingly.

By Mr. JACKSON:

Q. Am I right in understanding that you impose a lower limitation, as to how far the low flow may be reduced?

A. Yes, sir; I impose that same limitation, that is, maintenance of pool level, allowing for lockage, leakage, evaporation and same restrictions as to the loading of boats, and their location within the channel.

2306 Q. In your opinion, what effect, if any, upon navigation would result from increase in stage at the head of Gallipolis pool at a rate not exceeding 1½ feet per hour?

A. The rate itself has no material effect one way or other on navigation. It is only material when the increase continues to a point where the discharge exceeds 22,000 second feet, when we get resultant current velocities which might adversely affect navigation.

Q. Is that figure based upon your consideration of the physical characteristics of the Gallipolis pool?

A. It is.

Q. And was that true of the similar figures you gave for London, Marmet, and Winfield?

A. That is true for the other pools.

Q. In your opinion, what, if any, effect upon navigation would result from increase in stream flow at the head of Gallipolis pool at a rate not exceeding 7,000 second feet per hour?

A. The answer I gave to a previous question with reference to change in rate of flow would apply here, in other words, the rate is immaterial, it is a question entirely of reaching a critical stream flow velocity.

Q. Major, in your opinion, what, if any, effect upon navigation of the Gallipolis pool would result from a decrease in stage at the head of Gallipolis pool for not more than two hours at a rate not exceeding 1½ feet per hour?

A. Under those conditions, in my opinion, the same restrictions must be applied as in the case of the other pools. This rate of decrease in flow, in itself, is not particularly material, it is only when the flow gets below a certain total, which should be enough to take care of maintaining the pool at project level and allow for loss by lockage, leakage and evaporation, and the same

2307 restrictions I previously applied as to the loading of boats and their location in the channel would apply in this case.

Q. Instead of assuming the figures in stage, at the head of Gallipolis pool, for not more than two hours at a rate not to

exceed 1½ feet an hour, assume figures in discharge at the head of Gallipolis pool for not more than two hours at a rate not exceeding 7,000 second feet per hour, what, if any, effect upon navigation would result?

By the COURT. What do you mean by 7,000 second feet per hour?

By Mr. JACKSON. If the flow at the Gallipolis pool was 20,000 second feet at noon, and later at one it was 13,000 second feet there would be a decrease of 7,000 second feet in the hour.

A. The answer I just gave with reference to change in stage at that particular location would apply in reference to figures in discharge at the rate given in view of the relationship existing between the decrease in stage and decrease in total discharge.

Q. Major, in the case of the Gallipolis pool, what, if any effect upon navigation would result from variation in flow into that pool in the amount of 2,500 second feet upward and downward from the prevailing average flow?

A. There again in view of the conditions of the channel and the critical cross section, a variation of 2,500 second feet, upward and downward, from any given stage, above that required to maintain project pool elevation, making allowances for the usual losses, any such variation would not have a material effect on navigation in that pool.

Q. What, if any, practical effect would an increase in stage, at a rate not to exceed two feet per hour, with a total rise in stage, not exceeding 5 feet, have upon the mooring, loading and unloading of barges or other vessels in harbors or at terminals along the Kanawha River?

A. I understand there is a total limitation or another limit placed on the total amount of change and that is placed at 5 feet. That being the case, the only effect on navigation under those conditions would be that the barge men would have to keep their eyes open more actively so that on a decreasing stage their
2308 lines would not part, and on a rising stage they could take in their lines, and whichever direction the stage was going they could properly adjust any spars they used for keeping their barges off the banks.

Q. You referred to rising and falling stages. I think I only asked about rising stages. Is your answer applicable to either rising or falling stages at the rate of 2 feet per hour with a maximum change of 5 feet.

A. Yes, it is.

Q. What is the present annual amount of commerce on the Kanawha River?

By Mr. JACKSON:

Q. Have you investigated such records as are available as to the amount of commerce on the Kanawha River?

A. Yes, such as are included in the list I have.

A. The annual commerce on the Kanawha River, based on the reports I have examined, is in the neighborhood of 2,000,000 tons a year.

By Mr. JACKSON:

Q. Assuming the Winfield and Gallipolis dams to have been placed in operation and assuming the present conditions of commerce on the Kanawha River, what would be the effect, if any, upon navigation, in the pools in the Kanawha River, if the flow into the London pool were to be reduced for a prolonged period to 200 second feet?

A. There would be no material effect.

Q. Why do you say that?

A. Because on the basis of the existing commerce in the neighborhood of 2,000,000 tons a year, in my opinion there is amply water available to take care of losses by leakage and evaporation and take care of locking that volume of commerce.

Q. Assuming the Winfield and Gallipolis dams to have been placed in operation and assuming an annual amount of commerce on the Kanawha River of 15,000,000 tons, what, if any, adverse effect upon navigation on the pools of the Kanawha River, would result if the flow into the London pool were reduced for
2309 a prolonged period to 500 second feet?

A. There would be no adverse effect under those conditions.

Q. Please state why?

A. Because it would still be possible to maintain project pool elevations and have enough water for losses due to leakage and evaporation, and to lock through commerce to the amount of 15,000,000 tons a year.

Q. Now assuming the Winfield and Gallipolis dams to have been completed and placed in operation, and assuming an annual commerce of 30,000,000 tons at Gallipolis, what, if any, effect upon navigation on the Gallipolis pool would result if the flow of Kanawha River at its mouth would be reduced for a prolonged period to 500 second feet?

A. There would be no adverse effect under those conditions.

Q. Please give your reasons for that.

A. If the flow into the Ohio River from the Kanawha were reduced 500 second feet there would still be enough water in the Ohio River at the Gallipolis lock and dam to take care of the requirements for lockage, leakage and evaporation, even with an annual commerce of 30,000,000 tons.

By the COURT:

Did you make your calculations in respect to that question with reference to the number of vessels that might be carrying or bearing the tonnage?

A. I did not quite make it that way, but with the same results, probably, because I took and assumed the loading of a particular barge. Take a thousand ton barge for instance, I assumed it would be loaded——

Q. What I meant was that you must have taken some basis in that regard.

A. Yes, there is a basis for that matter. I assumed 48 lockages per day, through the locks, and that the average tow would be 2,500 tons, composed of four to six barges. In other words, 2310 going downstream, the loading would be considerably more than 2,500 tons. Then the barges might come back light, so that would reduce the average tonnage and the average tonnage per lockage, and on that basis with 48 lockages per day and 2,500 tons per lockage, for a 300 day period, allowing 60 days for miscellaneous interruptions, which is more than ample on the Ohio River, it comes out 36,000,000 tons a year.

By the COURT:

The reason I asked this question was I wanted to find out how much weight to give your evidence, and I wanted to know the basis on which you made your statement.

A. Is that clear enough?

Q. Major, in arriving at this answer or figure that you have just given, did you compute the lockage requirements?

A. I did.

Q. Did you compute it in accordance with any practice recognized by army engineers in reporting on the subject?

A. I couldn't say I took their actual method of calculation, but it is entirely based upon figuring out what is the reasonable expectation in the way of number of lockages per day you can get through a lock in the first place. In other words, if you assume there is going to be some interruptions and traffic will not move without a hitch entirely, and you assume a lock of a certain lift, say in the neighborhood of 20 feet, one lockage, according to experience would take, on the average, about half an hour. That would mean 48 operations per day, if the locks were being used continuously. Then you compute the amount of water contained in a single lockage.

By the COURT:

Q. Do you have the dimensions and capacity of those locks?

A. Yes, I have.

By Mr. JACKSON:

Just finish your answer.

A. Then running that into the number of days per year, you get the total number of cubic feet of water required
2311 in the 48 lockages per day. Then you have to convert the total number of cubic feet back to day second feet, that is, cubic feet per second, used continuously throughout the day. For purposes of illustration, at the Gallipolis lock, at 48 lockages per day, and in the first place a single lockage requires 20 day second feet, and therefore 48 lockages per day would require 960 day second feet, in other words, 960 cubic feet per second would be required.

By Mr. JACKSON:

Q. Am I right in assuming or understanding that on that hypothesis there would be continuous operations at the locks for 24 hours?

A. Practically so, and then convert that into tonnage, and you can make an assumption of how much would be the average cargo locked through at a certain time.

Q. Do engineers, in studying this subject, make estimates this way?

A. They do. As a check, I found the War Department had a lock on the Ohio River with over a 13 foot lift, they allowed 45 lockages per day and gave an annual capacity of 37,000,000 tons per year. That was approximately the figure I got, 36,000,000 tons.

Q. Please state whether as a practical matter it is possible to maintain a slack water navigation pool at constant elevation without any minor variations from the nominal pool level?

A. Based on experience, from the navigators end, I have learned that in practice the pools are not kept at the theoretical project elevation, but there is usually a minor variation, possibly 6 inches one way or the other.

By Mr. JACKSON:

Q. Major, shortly before recess you testified that as a practical matter, minor variations up to 6 inches above or below nominal pool level do occur at slack water navigation. Will you please state what, if any, effect, such minor variations from nominal pool level have upon practical navigation?

2312 A. Navigators themselves take this into consideration when it comes to the loading and maneuvering of their vessels.

It has been found from experience that dredging operations themselves cannot be conducted to that particular degree of accuracy, namely 6 inches. It is also the experience of navigators

that nature itself upsets conditions more rapidly and to a greater extent than the minor changes in pool levels under consideration would. It has also been found by experience that the operators of the pool cannot maintain that degree of accuracy. For that reason I made my first statement, that navigators, having these various elements of uncertainty to contend with, find that the possible fluctuations in pool levels are only one of several things with which they contend, so that in making allowances for these other difficulties, they, at the same time, make allowances for minor fluctuations in pool levels.

2313 Cross-examination by Mr. THOMPSON:

Q. Mr. Putnam, I think you said that you took a course at the Army Engineers School, did you not?

A. I did.

Q. That involved two inspection trips, one on the Ohio, and one on the Monongahela?

A. Yes, sir.

Q. The Monongahela is a tributary of the Ohio?

A. Yes, sir.

Q. How long were those inspection trips?

A. I don't recall.

Q. Were you there a week?

A. We took a trip which included both streams at the same time. We started on the Monongahela river and went downstream to Pittsburgh and down as far as Louisville. I thought it would take a week or ten days, and it was somewhere in that range, but I would not say exactly.

2314 Q. How long were you at the Army Engineering School?

A. From September 1914 to May 1916.

Q. That is located where?

A. At the present time it is located at Fort Belvoir, Virginia.

Q. Where was it when you took your course?

A. At the Washington Barracks.

Q. As a matter of fact, all of your work there was technical, that is, theoretical?

A. All the work I had at the Army Engineering School with respect to river and harbor improvements, outside of these two inspection trips, was confined to the study of text books, documents and lectures.

Q. And most of your work there was with regard to the movement of troops?

A. No, sir.

Q. Or engineering work in that line?

A. No, sir, it was not.

Q. I think you said you went to Europe on a trip?

A. Yes, sir.

Q. And that you went to Germany?

A. Yes.

Q. Did you inspect the canal that runs from the Danube to the Rhine River?

A. I did not.

Q. Do you know there is a canal that goes over two ranges of mountains and connects those two rivers?

A. I have heard of some such project.

Q. When you were in Europe I thought you made studies of these various conditions?

A. I made studies in Europe which I thought would apply to a local situation.

Q. The local situation was the Chicago situation, was it?

A. It had largely to do with the question of the relationship between barge transportation and ship transportation and
2315 whenever I found a combination of the two, I made investigations accordingly.

Q. You know that the canal that connects these two rivers is a barge canal?

A. I don't know much about that particular canal.

Q. Was your trip to Europe—over how long a period of time was it?

A. It was between two and three months.

Q. How many countries were you in?

A. I was in France, and I went through Switzerland to get to a certain point on the Rhine in Germany. I went through Amsterdam to get to Belgium and I was in Belgium and in England and in the southern part of Scotland.

Q. You did not, therefore, see many projects of power development or anything of that kind over there on navigable or non-navigable rivers?

A. I just recall one or two; not to any extent.

Q. Your trip was more or less a pleasure trip, wasn't it?

A. No, sir.

Q. What did you do in the way of hydrography, in the way of study?

A. Nothing in the way of hydrography.

Q. And you did not do anything in the way of construction, did you?

A. I inspected the construction of several projects.

Q. And none of these projects were power projects?

A. No, sir.

Q. When you returned, you returned to Chicago and you were the assistant district engineer, I believe?

A. That is not correct.
Q. That was afterwards, was it?
A. Yes, sir.
By Mr. JACKSON: That was before.
By the WITNESS. Before the European trip, I was district engineer at Chicago.

By Mr. THOMPSON:

Q. You represented some company in Chicago. What was the organization that you represented when you came back from Europe.
A. I was connected with or engaged by the Commercial Club at Chicago.
2316 Q. Do you still represent them?
A. No, sir.
Q. You represent the other company—the shipping company, do you?
A. I am secretary and treasurer for that company.
Q. Did you give the name of the company?
A. No, sir.
Q. What is the name?
A. Leathem-Smith-Putnam Navigation Company.
Q. The Leathem-Smith-Putnam Navigation Company?
A. Yes, sir.
Q. Their office is in Chicago, is it?
A. Yes, sir.
Q. Do you spend most of your time there?
A. Most of my time, yes, sir; I will say about seventy-five per cent.
Q. How long were you district engineer?
A. About four years.
Q. So that approximately you were with the Government about five years?
A. Approximately—exactly five years, yes, sir.
Q. And since then you have been in Washington practically all of your professional life?
A. In Chicago.
Q. I mean Chicago. Please excuse me. The area around Chicago is very flat, isn't it?
A. Yes, sir.
Q. Do you know the course of the Des Plaines River?
A. Fairly well.
Q. Do you know of a divide from Chicago River that you had to go over in times past to get to the Des Plaines River?
A. I live within about two miles of it.

2317 Q. It is a fact that in Chicago that this river, the Des Plaines, runs through the town of Cicero part of the way on one edge of Cicero, isn't it?

A. It may for a fraction of a mile go near Cicero. I don't think it touches it.

Q. There are a great many bridges—cement bridges crossing that river, are there not?

A. Yes, sir, there are.

Q. And there are places where it is almost impossible to observe what was the channel of the river?

A. (No answer from witness.)

Q. Do you recall where the park is now?

A. There is a forest preserve section, I believe, around that particular point.

Q. And in the forest preserve, you cannot see anything but sand?

A. The old channel is obliterated by artificial filling and things of that character.

Q. And isn't it a fact that it is practically impossible for a child even to put a play-boat on there at that point?

A. At that particular location?

Q. Yes?

A. No, I don't think so, at that identical spot. I don't know the exact point—it is pretty hard for anybody to identify that, but in that vicinity there is a small amount of cano'ing.

Q. There is no possibility of navigation on that stretch of the river now, is there?

A. Not in its present stage, no, sir.

Q. And there hasn't been any navigation there for one hundred years, has there?

A. I don't know.

2318 Q. What do you mean when you speak of navigation?

A. By navigation I mean the practical use of a stream by boats carrying cargoes or trade or commerce of some form and variety.

Q. What size boats do you mean would do it?

A. I would not place any restrictions on the size except below a point where they will be so small as not to be of practical use.

Q. Would you say that a channel that was carrying canoes that carried two tons or less, for one-third of the year only, would be navigable?

A. For one-third of the year only?

Q. Yes.

A. I would not.

Q. You would not think that was navigable.

A. No, sir.

Q. Do you know that in the case of the Economy Light and Power Company the question arose over the navigability of the Des Plaines River and the records show that for only one third of the year in times past, in the early days, there was a possible navigation without having to portage one-third the distance of the Plaines River?

By Mr. JACKSON. We object to that because it does not correctly state the record and it is immaterial and irrelevant and incompetent.

By the COURT. He may answer.

By Mr. JACKSON. We except to the ruling of the Court for reasons stated.

A. I don't know that the records show that.

Q. If the records show that, would you say that the Des Plaines River was navigable in its natural state?

By Mr. JACKSON. We object to that, because it does not include the full statement of the record.

By Mr. THOMPSON. I am just testing his judgment as to what he means by navigation. He says it is not navigable.

The foregoing objection is overruled and the defendant, by counsel, excepts to the ruling of the Court for reasons stated.

By Mr. THOMPSON:

Q. I will ask that the question be read. [The question is read.]

A. That would all depend on whether or not that was the only means of transportation involved, and as to whether or not there were other means available that were more practicable, so that there would not be any choice between the two methods. As I previously stated, the question of navigability has some relationship to its practical use.

Q. Do you consider the Des Plaines River a navigable river?

A. I made no study of that with that in view.

Q. You can look at it. You don't have to study it.

A. It may have been susceptible of use in the early days by the boats that then prevailed.

Q. How many railroad bridges are over it within the
2319 distance of ten miles of Chicago?

A. I don't know.

Q. How many various railroads run by it, do you know?

A. Yes, sir.

Q. The Santa Fe?

A. Yes, sir.

Q. And the Rock Island?

A. Not the Rock Island.

Q. That is about a mile over there?

A. It comes in fairly close to the Des Plaines in Joliet.

Q. The water is taken out by canal out of the river and subsequently, away below is brought back in the river?

A. No, sir; that is not true.

Q. What canal is that?

A. The Chicago Drainage Canal.

Q. The Chicago Drainage Canal?

A. It takes no water out of the Des Plaines except in time of floods, the Des Plaines flows into it.

Q. What is the canal between the lake and the river—the older canal?

A. The one to the southerly side of the drainage canal?

Q. I am not sure that it is south?

A. It is south and easterly, a diagonal line; that is the old Illinois and Michigan Canal.

Q. Doesn't it take water out of the river?

A. It may have years ago, but I don't think so. The main drainage canal is between this small canal and the Des Plaines River.

Q. You know something about the Des Plaines River and its location, do you?

A. Yes, sir.

Q. The question I want to ask you is, if in your opinion, you think it is a navigable river.

A. I cannot give such an opinion.

2320 Q. You have looked at it a great deal more than you did at the New River?

A. There is no question about that.

Q. And you have lived within two miles of it?

A. Yes, sir.

Q. And from your own observations, would you say it is a navigable river?

A. From my own observations, I would say it is not susceptible to use by boats carrying trade or commerce.

Q. Do you know whether or not there has ever been any navigation on New River?

A. I have noticed references to—in some of the earlier reports of the Chief of Engineers, of the use of the river by boats in certain sections.

Q. What kind of boats were those?

A. As I recollect the description, they were called bateaux.

Q. And those boats were about how long?

A. Roughly, I would say fifty feet.

Q. How many tons would they carry?

A. I don't recall that definitely; I will say in the neighborhood of two or three tons, on a very slight draught, that is about eighteen inches or two feet.

Q. Didn't the Army report say that they carried six or eight or more tons?

A. I don't recall that.

Q. Do you remember from the Army Engineers' reports, how many of those boats there were on the river—on New River?

A. According to those reports, as I remember them, they referred to some ten or twelve boats or thereabouts that were in existence on the river at one time.

Q. Didn't they finally go to eighteen or twenty-five boats?

A. I don't remember that figure.

2321 Q. In reading these reports of the early days of the engineers you gave credence to those reports, didn't you?

A. Yes, sir.

By Mr. THOMPSON:

Q. You said that it was not navigable in its natural state?

A. I said it was not navigable in its natural state, yes, sir.

Q. Let me read to you from Plaintiff's Exhibit No. 47, on page 6: "In 1883 there were about seventeen keel boats in this traffic and there are still about ten or twelve of such boats now on the river. These keel boats, as they are called, in this traffic, have an average length of about sixty feet and a width of six or eight feet; their draught is about two feet."

Do you remember that statement?

By the WITNESS. I do remember that substantial statement.

By Mr. THOMPSON:

Q. I will read another paragraph No. 9: "From Hinton to Glen Lyn, a distance of 30 miles, there was some commerce, consisting of grains and miscellaneous merchandise." In view of that statement, would you say that New River, between these points, was not a navigable river?

A. Yes, sir; I would say so.

Q. Upon what theory would you say so?

A. Upon the theory that this particular report that you refer to deals with the period shortly after the time some work was done on the river between those points by the Government engineers, and my understanding of the question of what is and what is not a navigable river, refers to the river in its natural state.

Q. So you think that, New River having been improved, take it out of the class of a river that is navigable in its natural state?

A. Not necessarily, but I don't want to be understood as saying that it is navigable because they have made improvements.

Q. Is it your understanding that, if improvements are
2322 made on the river, it takes it out of the class of being navigable in its natural state?

A. Not necessarily.

Q. You don't know anything about the question of navigation on New River prior to the improvements made by the Government, do you?

A. The question of navigation—the fact of navigation—of navigation having existed?

Q. Yes?

A. No, sir, I do not.

Q. Let me refer you to Government's Exhibit No. 31, being report of Chief of Engineers of 1873—when were the improvements first made on New River by the Government?

2323 A. They began, as I remember it, either in 1872—I mean 1877 or 1878; I think it was 1877.

Q. I am reading from a report of the Chief of Engineers. I have just given you the Exhibit number; "The present system of transportation on this portion of the river is by keel boats, which carry from two to three tons and are rowed or floated down the river and poled up," and I am now referring to the point from the Lead Mines to the Greenbrier. Would you say that there was not any navigation on the river prior to the improvements made by the Government; after reading that statement?

A. I would not say that there was not any navigation.

Q. If there was navigation, wouldn't that part of the river in its natural state be a navigable river?

A. No, sir.

Q. Why not?

A. Because there is nothing in this report to say whether or not that was a regular or an intermittent system of transportation; what time of the year it occurred—whether or not they handled that in August or more or less through the year regularly. There is nothing in that statement to cover that.

Q. That statement doesn't mean a thing to you, then?

A. It only means what it says—that the present system is by keel boats.

Q. If they were keel boats, wouldn't that mean that the river was navigable?

A. No, sir; not necessarily.

Q. I call your attention to Government's Exhibit No. 33, at page 62, being the report of 1877. "A survey of this portion of New River—the improvement of New River from Wythe County to the mouth of the Greenbrier River. A survey of this portion of New River was made in 1872 and the report was printed in

the Annual Report of the Chief of Engineers for 1873.
2324 Two estimates were submitted, one looking to an improvement to facilitate the navigation by keel boats, now used, at a cost of $100,000; the other contemplated a three-foot steamboat navigation to cost $1,000,000." Do you recall reading that section?

A. Yes, sir.

Q. Would that have any effect upon your determination as to whether or not there was navigation prior to the improvement on the river by the Government?

A. No more than the previous extract that you read to me and for the same reason.

Q. You spoke about John Marshall's report. You read that report, didn't you?

A. I did.

Q. When did you read that report?

A. About two weeks ago.

Q. In the preparation of this case?

A. Yes, sir.

Q. You also spoke about Moore and Briggs' report?

A. Yes, sir.

Q. You read it, did you?

A. Yes, sir.

Q. About two weeks ago. Both of these reports tell about trips going down the river from Hinton to the mouth of the river, do they not?

A. I am not sure about both, but I am reasonably sure that one or the other did.

Q. Which one of them did?

A. The Moore and Briggs', as I recall.

Q. Did you forget about the trip of Chief Justice Marshall, when he said that he got all the way down, except that he had to get out at one place?

By Mr. JACKSON. We object to that.

2325 By the WITNESS. He came down towards——

By Mr. THOMPSON. (Interrupting.) To the mouth.

By the WITNESS. Beeween Hinton and the mouth.

Q. And he went through what is known as the Narrows—the gorge, I mean.

A. I recall a reference to that.

Q. Would you call a trip like that navigation?

A. No, sir; I would not.

2326 By Mr. THOMPSON:

Q. The fact that Moore and Briggs went from Sinking Creek to Hinton and to the mouth of the river, would that have

any influence upon you as to whether or not you could determine if this river, in its natural state, was susceptible of navigation?

A. It would not.

Q. If it is a fact that a man by the name of Laomi Baldwin made a trip down the river through the gorge, would that have any effect on your conception of navigation?

By Mr. JACKSON. We object to that because it is highly improper. That report was introduced only to show that Baldwin went to Kanawha Falls and he failed to get by there and finally they had to meet him in a boat from Charleston.

By Mr. THOMPSON. I challenge that statement.

By the COURT. There was a big dispute as to whether or not Baldwin travelled by land or sea.

By Mr. THOMPSON. He is interrupting me [indicating Mr. Jackson].

By the COURT. Let's get the Baldwin statement.

By Mr. JACKSON. If counsel will point out to me anything showing that he travelled by boat down there, I would like to see it.

By Mr. THOMPSON. That is about a survey that he made.

By Mr. JACKSON. That is an official report.

By Mr. THOMPSON. That report is silent on that question.

By Mr. JACKSON. If he can show me what I asked for, I will withdraw my objection and apologize.

By Mr. THOMPSON. We have here a history of Summers County [indicating].

By Mr. JACKSON. That is not in evidence and is not proper.

By Mr. THOMPSON. Mr. Kegley said it was worthy of consideration; Mr. Kegley vouched for it. There is no mention of his going down the river in that report.

By Mr. JACKSON. That is the reason you did not put it in.

By Mr. THOMPSON. Certainly not. It is entirely silent.

By the COURT. What does it say there?

By Mr. THOMPSON (reading): "The New River country was visited by Chief Justice Marshall, and they went down the river as far as its mouth at Foss east of Summers Courthouse, and then they turned up New River and proceeded to the mouth of Indian Creek, then they ran on down the river to the present site of Hinton, and then down New River to its mouth."

By Mr. JACKSON. That is impeached by Mr. Baldwin's own report.

By the COURT. The historian says that they moved up and down New River on a boat and came to the mouth of the Greenbrier and proceeded up the river in a boat.

By Mr. THOMPSON. That report is perfectly accurate, but it does not refer to this trip.

By Mr. ABBOT. Which shows that he did not take it.

By the COURT. Does the historian say the date of that?

By Mr. THOMPSON. Yes, sir; in 1817.

By Mr. JACKSON. He has got that confused with Moore and Briggs and the history of Summers County is a work that is strikingly notable for its absence of authorities.

By Mr. THOMPSON. He gives the length of the boat as 50 feet long.

By Mr. JACKSON. That is pretty conclusive.

By the COURT. What was the question?

By Mr. THOMPSON. I asked him if such a trip was made by Baldwin in 1817 down the river, through what is known as the gorge, whether or not that would have any effect on his opinion as to whether or not New River was navigable waters in its natural state.

By Mr. JACKSON. We object to that, because the only evidence in the record shows that he never went down the river in a boat.

By Mr. THOMPSON. May I read to the Court a paragraph from Rogers on experts at page 79 and 80: "On cross examination of a witness, counsel may be permitted to ask hypothetical questions, whether or not the facts were testified to by the witness or not."

By the COURT. I don't think that quotation is at all applicable. You asked him the question about Baldwin going down the river and you are asking him to assume that it is true. I don't know—this man has written a long report here and he said he had a great deal of difficulty. I don't know whether he said he went down New River or not.

By Mr. THOMPSON. There is not a word about it, no, sir.

By Mr. ABBOT. No, sir. He says he went to Kanawha Falls and could not go down New River to do that, and that he met a boat below Kanawha Falls sent up from Charleston to meet him. Why would he do that if he had just gone down the river.

By the COURT. He does not mention New River in his report.

By Mr. THOMPSON. No, sir. We objected to it.

By Mr. JACKSON. We did that because you implied that he made a trip down the river in a boat, and we wanted to show what he did do.

By the COURT. It comes to this—you have introduced a history of Summers County, in which some historian says that Baldwin made a trip on New River in a boat in 1817. In rebuttal of that, here is presented a copy of Baldwin's report himself, which is made to some official body—the Board of Public Works of the General Assembly of the State of Virginia—it is directed to them, relating about the trip that he took the same year, only it appears that his explorations were along the Jackson River and overland route connecting with the Kanawha River. He does

not mention that he was on the New River, but his report shows that he was on the upper reaches of the James River and the Jackson River, and surveyed a road overland to Gauley River, possibly where the Gauley runs into the Kanawha, and from that point, he traveled, at least a portion of the way, by boat. Now, we have here two conflicting pieces of evidence. You want me to assume that the historian is correct and that as to Baldwin himself, his report is inaccurate.

By Mr. THOMPSON. I do not understand that they are in conflict in any way. I don't know how long that trip took, but my recollection is that it was a few months. There are nine months left in which he could make that trip. I don't understand that they are in conflict. That is the reason I objected.

By Mr. JACKSON. The History of Summers County has not been received in evidence and if anyone goes on the stand to vouch for it, we want to cross-examine the witness. I don't think you can find a reputable historian to vouch for it.

By Mr. THOMPSON. We can produce the record and show where Mr. Kegley said it was reliable.

By Mr. THOMPSON. We had it marked for identification.

By Mr. JACKSON. You offered it and we objected and were sustained.

By Mr. THOMPSON. We will offer the book in evidence.

By Mr. JACKSON. We will want to cross examine whoever presents it.

By the COURT. I think the statement in this history is not of value. The statement of Baldwin does not say anything about New River. He says he came over Kanawha Falls at the same time that the historian says he traveled up and down New River and the historian does not say anything about the difficulties of the travel or anything about the size of the boat——

By Mr. THOMPSON. Yes, sir; he says it was fifty feet long.

By the COURT. All right; but he says nothing about the difficulties; he says they traveled in a boat 50 feet long and went to the mouth of the Greenbrier——

By Mr. THOMPSON. He says the exploration was made in a boat 50 feet long and that they went to Foss, a mile East of Summers courthouse, and turned up New River and went down the river to the site of Hinton on New River at its mouth.

By the COURT. He says nothing at all about the difficulties or the lack of difficulties. Your question is based on the implication that the man went up and down New River on a boat, without any difficulties. In view of his report, I do not believe that the man was traveling on New River at all at that time. He says nothing at all about it in his own report. You can ask the

question but I want to tell you what I think about the history of Summers County.

The defendant, by counsel, excepts to the ruling of the Court for reasons stated, and because it is immaterial and irrelevant and not based on the evidence in this case.

By Mr. THOMPSON:

Q. I will ask that the question be read.

(The question is read.)

A. Even if such a trip were in fact made, it would make no difference in my opinion.

Q. Major, I want to read you a reference from the report of the Chief of Engineers for the year 1879, Exhibit 35:

"The detail maps of the season's operations completed in the office, the property collected together and put in repair, and, finally, all boated down to Hinton, West Virginia, at the mouth of Greenbrier River, a distance of 84 miles, to which point, under your decision, operations were to be transferred in the future as a base. Everything was closed up by October 15."

Do you remember reading that?

A. What page, if you please?

Q. I have got the original here, but I haven't the exhibit.

By Mr. THOMPSON:

Q. Would that affect your judgment as to whether the river was navigable, or not, in its natural condition?

A. It would not affect my judgment.

Q. It would not affect your judgment?

A. No.

Q. Would the fact that the Army Engineers had sent a boat with a motor attached to it, an outboard motor, drawing about two and a half feet, from Hinton to Allisonia and back, within the last few weeks, influence your judgment as to whether
2327 New River is a navigable river?

Mr. JACKSON. I object to the question unless he states the size of the boat and the difficulties encountered in pulling over ledges and bars.

By the COURT. I think there should be some indication of the size of the boat.

By Mr. THOMPSON:

Q. A boat 16 feet long, and five feet wide, and drawing two and a half feet of water at the most?

Mr. JACKSON. I think it should be shown that the witness stated——

Mr. THOMPSON. I do not care to have counsel address me.

The COURT. I think the question should contain all the conditions attending that movement—the number of persons in the boat and such as that.

By Mr. THOMPSON:

Q. Four persons in the boat, and a survey outfit, and the parties getting out only once on the trip from Allisonia down to Hinton, and then getting back into the boat—in other words, not portaging—and getting out on the trip five times over shallows, but not portaging, would that influence your judgment as to whether New River is navigable?

Mr. JACKSON. I object to the question unless he shows how many times he had to pole, and unless he shows what falls they had to get out and walk over.

The COURT. You may answer the question and save the point.

Mr. JACKSON. Exception.

A. That would not affect my judgment.

By Mr. THOMPSON:

Q. How far up the river did you say you went?

A. I touched the river at a point on each of the forks in North Carolina, and then jumped back to the mouth of Wilson.

2328 Q. And when you were noticing the flow of the river, did you know whether or not the Buck dam was closing down for any period of a day, and then discharging water?

A. No, I did not.

Q. So that, when you looked at the river, you would not have known whether that was having any effect on the depth of the river, would you?

A. I would not know how much effect it would have on the depth of the river.

Q. You would know, though, it would have effect?

A. It would have some effect on the depth of the water in the pools and the amount of water that went across the falls.

Q. Would your judgment have been changed by the fact that, at the time you were looking at the pools, or shallows and water, the water had been shut off, or whether the wave had reached that point?

A. I do not think so, because I could see from the water line where the water had been some time during the day previous, and still showed exposed rocks and boulders and shoals that had no evidence of the water line.

Q. That would indicate that you did notice that there was fluctuation?

A. Yes, I did notice that there was a fluctuation.

Q. Now, let me get the date that you went over there? Where did you start from?

A. I started from here.
Q. From Roanoke?
A. Roanoke, yes, the morning of July 28th, this year; then eaded for North Carolina, crossing the river enroute at Jack- n Ferry; then beyond Galax, coming back on the other side of e river; then at a point where I crossed New River some little stance this side of the line, and then down in North Carolina— rst crossed the South Fork and then the North Fork, and then back a road.
Q. Where did you stop that night?
A. I came all the way back to Roanoke, getting in about o'clock in the evening.
Q. How many miles did you travel that day?
A. I will say between 300 and 350. I don't know exactly.
Q. Did you attempt to look at the river that day at all?
A. I did.
Q. And is that all the time you spent on the river up-stream— at is, from Radford?
A. That is all the time I spent on the river between Jackson erry and the North Carolina points I mentioned.
Q. Is that the only time you were ever up there?
A. No. I was up there in the lower end again last Saturday, the location just below the Buck dam—a little above Ivanhoe urnace.
Q. But you did not go up above Buck dam at any other time, d you?
A. No, I did not.
Q. That was the only time. Well, now, how many places did ou stop on your trip when you made the 350 miles in a day— at is on the river?
A. About ten different places.
Q. About ten.
A. Yes.
Q. The water in the river is very low, isn't it?
A. I have no information as to the amount of water in the ver. There was not much water at certain places I looked, if at is what you have in mind, but I would say that is below the wer dam. Above it would depend on the natural flow.
Q. You do not know the natural flow?
A. Only as reported in previous surveys, which I had studied reviously.
Q. On your ten stops, did you make any measurements of the depth of the river? Did you get out into the river yourself?
A. No.
Q. You just looked at it from the shore?
A. Yes.

Q. So, if there was a channel there, you would not know how deep the channel was?

A. I would not.

Q. Now, what time were you at the power dam?

A. I would say between 3 and 4 o'clock in the afternoon.

Q. And was the project discharging water at that time?

A. I don't know.

Q. What was the condition of the flow of the stream on that Saturday when you went up on the trip from here to the power dam, as to flow?

A. The stream was in a pretty low condition.

Q. In a pretty low condition?

A. Yes.

Q. What did you do when you got out on those visits? Did you just stand on the shore and look at the river?

A. I looked at the river, looking at the configurations of the bank, to see what effect would happen, roughly, with increased stages. I noted wherever I happened to drop in whether or not there was a section of pools there, whether or not there happened to be riffles, or boulders or shoals.

Q. There was not any way, on this trip, for you to make any check as to depths, as to whether the mile-to-mile depths, as shown by Craighill and others, were correct or incorrect?

A. No.

Q. As a matter of fact, if you made ten stops and covered 350 miles in a day, a part of which I understand was on pretty rough roads, they were short stops?

A. It was a long day.

Q. What time did you start?

2331 A. 7 o'clock in the morning.

Q. What time did you get back?

A. I think about 10:30 or 10 o'clock.

Q. What time did you get to New River? What time did you first see New River on that day?

A. That is when I crossed at Radford, which would be an hour to an hour and a half from here.

Q. Do you remember what your next stop was?

A. I didn't stop at that particular crossing, as I wanted to get up at the far end, and I went to Jackson Ferry, and then went to these other places, and stopped at the last point before I went into North Carolina.

Q. What time of day would it have been?

A. 11:30 in the morning.

Q. So the ten stops you made were made from 11:30 until what time in the day?

A. The last stop was at 5:30 in the evening.

Q. That is six hours. Now, can you remember where the stops were you made—at what points?

A. Not without reference to my notes. I can remember some, but not all.

Q. Can you give us those you remember?

A. I remember the stop at the highway crossing just before getting into North Carolina. I remember the stop at the two branches up in North Carolina. I remember the stop just below the mouth of Wilson and a stop at the foot of what is known as Osborne's Shoals.

Q. Where is that?

A. Roughly, six and a half miles below the mouth of Wilson. The next stop I can recall was just below Fries. The next was in the vicinity of Ivanhoe Furnace. The next was the Lead Mines. The next was just above Jackson Ferry, and the last was at Foster Falls.

2332 Q. That is nine, I believe.

A. I must have missed one. I just counted ten.

Q. Well, four of those stops were made at points not downstream further than Wilson Creek?

A. There were two of them made beyond the mouth of Wilson.

Q. I think you gave four made at Wilson or further upstream?

A. The point the highway crosses is just below the mouth of Wilson.

Q. Just below?

A. Several miles. I don't know how many, but four to six.

Q. If you had spent all your time at these various places, you would have spent about half an hour at each one of them, wouldn't you?

A. A little more than that.

Q. So that subtracting from that the time you took to make the automobile trip, you had very little time to stop and look at the river, did you not?

A. I don't imagine I averaged over ten or fifteen minutes at any one point.

Q. At what other time have you seen the river? The first trip was on the 28th, and then I believe on Saturday you went to the Buck dam?

A. That was last Saturday I went back. The first time was on the 28th of July.

Q. Now then, from Radford down, what did you do in the way of looking at the river?

A. My first visit there was on the 29th, starting in at the Radford dam site. From there I worked on down to Hinton, getting there late in the afternoon.

Q. And you ran from Radford to Hinton from the morning until the late afternoon?

A. Yes.

Q. What time did you start in the morning at Radford?

A. I think I started at Radford abut 8:30.

2333 Q. And you got down to Hinton about 4 or 5?

A. About 5 o'clock.

Q. It is 84 miles by road, isn't it?

A. I don't recall. It is not a very long way.

Q. How many times did you stop during that time from Radford to Hinton?

A. I stopped at the Radford dam site.

Q. That is about six miles above town, isn't it?

A. Yes. Then Ingles Ferry, crossed over at that point, and stopped there a few minutes. Then went down to the vicinity of Parrott Mines, and followed along the river to Walker's Mount Falls, I believe that they call it. Then I retraced my trip, and got back to the main highway, and went through to Pearisburg and over to the river at Klotz Quarry, I think is the name of the plant. Then back through Pearisburg to Narrows, Glen Lyn; then down on the back road along the river, passing Shumate Falls, stopping at Wylies, continuing on down that road to Crumps Bottom. I did not stop there. Then down to above Bull Falls, where I took the ferry across the river. Then down to Hinton.

Q. Do you make that eight stops altogether?

A. Seven would be the actual number of stops. I may have mentioned one for two stops.

Q. You were gone, as I figure it, from Radford eight hours and a half—that is, from 8:30 to 5—and you stopped off about an hour for lunch, did you?

A. Half or three-quarters of an hour. I did not take the full hour.

Q. We will call it a half an hour. You traveled approximately 100 miles. You doubled back?

A. No; I spent the night at Hinton. I doubled back a part of the way. It would make it, roughly, 100 miles from Radford.

2334 Q. And a good part of that time you were not in sight of the river, were you?

A. From the time I cut across from Radford and back to the river at Parrot Mines, I did not see the river in that stretch, and from Pearisburg there is a stretch of about 30 miles in there I didn't see it. The rest of the time the river was in sight most of the time.

Q. So your stops were about the same as the day before—about ten minutes?

A. I think that they would be longer, because I had more time.

Q. How long do you make them?

A. Not over an average of 20 or 25 minutes.

Q. Did you cover on your trip the stretch from Foster Falls to Radford?

A. No, I didn't get in that section at all.

Q. You didn't see that section at all?

A. No.

Q. That is a distance of how many miles?

A. Twenty-five to thirty.

Q. About thirty-eight by the Geological Survey. Did you go any farther down by Hinton by motor?

A. Yes, the next day I went down from there to the mouth of the Kanawha.

Q. That was on the 30th was it?

A. That was on the 30th.

Q. And that was from Hinton to the mouth of the Kanawha?

A. Yes, sir—No, I mean the mouth of the New River, pardon me.

Q. When did you start that day?

A. I left Hinton at 7:45 in the morning.

Q. And when did you get down to the mouth of the river?

A. A little before noon.

Q. That would be about four hours?

A. Yes, four hours.

2335 Q. You didn't follow the river, couldn't see the river part of the time, could you?

A. I could not see the river for quite a part of the time.

Q. How many stops did you make between Hinton and the mouth of the river?

A. Stopped at Stretcher Neck, in the vicinity of Stone Cliff, crossing the river at that point and back-tracking to get up on the road on top; thence to Fayette, and down toward Fayette station, and stopped again at that location; then I back-tracked again and the next place I got to the river was at the main highway crossing below Hawk's Nest development.

Q. Did you go up to the Hawk's Nest?

A. Yes, I went down to a place overlooking the valley where you could see the Hawk's Nest development.

Q. That would be four stops you made there and Stretcher's Neck, Fayette and Hawk's Nest.

A. Stopped at the crossing below Hawk's Nest.

Q. That would be five?.

A. Yes, sir.

Q. So you didn't have much time to stop and view the river, did you, covering that distance in four hours?

A. No, I would say ten or fifteen minutes to a stop.

Q. Was it upon that basis of time you made your estimate of $200,000,000 for cost of improving navigation to a nine foot depth on New River?

A. No, sir.

Q. That was your sole inspection of the river, was it not?

A. Yes, sir.

By Mr. JACKSON:

Q. You don't mean those three days was the only inspection?

A. No, I testified I had on August 10th made another trip in the vicinity of Buck, and it was on that trip I took in several other points that subsequent study had shown I ought to look at with more detail.

By Mr. THOMPSON:

2336 Q. What other places beside Buck?

A. From downstream working up, so I can remember the chronology, I began at Bulls Falls, Wylie's Falls, Shumate Falls, Walker's Mountain Falls.

Q. You mean you looked at those the second time?

A. Yes, sir; and the Sifford's Falls.

Q. Did you stop and look at Bulls Falls?

A. Yes, sir.

Q. Would you regard that as passable by a motorboat?

A. It might be passable.

Q. So that that spot you would say was navigable?

A. No.

Q. If it was passable by motorboat you wouldn't say it was navigable?

A. No, sir.

Q. You think navigation by motorboat is not navigation?

A. If it were continuous and substantial it might be navigation, but a mere passage by motorboat would not make navigation.

Q. What would lead you to believe it wasn't continuously passable?

A. No question was put to me as to that.

Q. Would you say it was not continuously passable or navigable by motorboat?

A. I would say most times you could go downstream in motorboat, but that doesn't make it navigable.

Q. Could you go upstream?

A. I would say possibly at low water. Take a pretty good motorboat to do it.

Q. If you could go at low water, couldn't you go in a motorboat at average flow?

A. I wouldn't know because I wouldn't know what the current velocity would be.

2337 Q. So far as that particular spot is concerned, you don't know whether it is navigable or not?

A. Yes; I do; in my own estimation.

Q. Your own opinion?

A. Yes.

Q. Based on what you told us here?

A. Yes, sir.

Q. Would you say Bulls Falls was impossible for a motorboat to go up if a party could take one of these punts or flat-bottom boats and push it over the Falls at low water?

A. I am not sure I am clear as to what you mean by punt.

Q. What they call a punt is a canoe or some name for a flat bottom boat.

A. Such as you see on some of these pools around here?

Q. Yes.

A. What is the question?

Q. Isn't that Fall there practically navigable so far as getting up the river is concerned?

A. No; it is not. Probably at low water it constitutes a drop of two or two and a half feet.

Q. Have you ever heard there was navigation for many years by bateaux up and down that river at that point?

A. You read to me an extract from a report showing during certain years a certain number of bateaux had operated in there.

Q. That would not affect your judgment as to whether that particular part was navigable?

A. No, sir.

Q. How did you arrive at this expenditure of $200,000,000; in other words, how many reservoirs did you figure on constructing?

A. I figured an average lift of twenty feet at each dam, making roughly about 1,800 feet of fall, approximately 1,800 feet between the head of the London pool and the mouth of Wilson. I mean, to overcome that fall some 90 locks and dams would

2338 be required, with an average lift of twenty feet.

Q. Why did you only make it twenty feet?

A. Because, there were two reasons for that, in the first place I felt if I exceeded twenty feet in some locations we would get into difficulties with the railroads along the bank; in the second place there is from the point of view of improving a stream for

navigation an economical limit, beyond which it is not wise to go on the question of lift, in other words, in attempting to save the number of dams, the cost of your structure per foot of lift increases somewhere above that point; and between those two I reached the conclusion a twenty feet average lift would be a reasonable assumption to make.

Q. The road-bed of the railroad, the C. & O. up through what is known as the Canyon is at least forty feet above the river, isn't it?

A. I am not sure it is.

Q. Any reason why you could not put in a dam higher than twenty feet, just as the Hawk's Nest people did?

A. If we don't get into trouble with the C. & O., the only reason would be an economical reason, and as I previously explained, it is generally cheaper to build two twenty foot dams than one forty foot dam for navigation alone.

Q. The dam at Hawk's Nest has a pool in it that is navigable, hasn't it?

A. Probably throughout the length of the pool; in other words, you can put boats there, if that is what you mean.

Q. And run them?

A. Yes, sir.

Q. Do you know any river where they have twenty foot dams?

A. Not exactly twenty feet, no, sir, some are twenty-four, some twenty-six, some eighteen and some down as low as ten, lots of them.

Q. Would you not, if you were building that project, or making that river navigable, for a nine foot depth, wouldn't
2339 you create power at the same time you stored your water?

A. It depends on the instructions I had. If I were told to put in a navigation project pure and simple I would put in something different than what I would if told to do something else.

Q. In this case were you told just to consider navigation?

A. This was purely a navigation project.

Q. You were not thinking in terms of what might be saved by the creation of power and amortizing that cost?

A. This was purely a navigation project.

Q. If you had created power on these projects you could have amortized your cost very considerably, couldn't you?

A. I do not know.

Q. Now the Radford project will have a pool twenty-one and a half miles, won't it?

A. I don't know.

Q. Don't you know the length of the pool?

A. No, sir.

Q. Do you know the defendant here has a project down at Bluestone, a double project, one at Bulls Falls and one to be at Bluestone also?

A. I have noticed reference to a possible project on the profile but that is about all I know of it.

Q. And the water from the after bay dam on the Bluestone will back the water right back up to Bulls Falls, won't it?

A. I do not know.

Q. And make it ten feet deep there?

A. I don't know.

Q. So you don't know anything about this question of proposed construction of dams up and down the river?

A. Only as I have seen from some profiles.

Q. You know the defendant is not intending to build any ten or twenty foot dam on the river?

2340 A. Any of those dams for which I have seen profiles on the river indicate some head greater than twenty feet.

Q. And everyone of those dams will improve navigation, or there will be navigation for boats?

A. There will be a navigation depth, a dependable navigation depth for the drawn down length of the pool, whatever that may be; there would remain a stretch between the high and low point you would have to do something to.

Q. You would have a pool for usable storage?

A. Possibly.

Q. And that would create navigation as the Hawk's Nest dam has created navigation?

A. It might.

Q. Now you have not given me very much information in regard to how you fixed this figure of $200,000,000. I am curious to know about that.

A. From my study of river and harbor projects elsewhere I have information as to the cost per foot of lift for locks the size used on the Kanawha at the present time 56 x 360 feet, and in this particular instance I would need 90 of those, on my assumption. Then I also have information available as to the cost of dam construction with rock foundation, roughly twenty feet of lift, or whatever unit you want to use, and combining these two I get a cost per foot of lift of the combination locks and dams, and making allowance in the dams for the relative width of this stream compared to others the cost is very close to $100,000 per foot of lift, so that comes out in the neighborhood of $180,000,000. Now the reason for rounding out that to $200,000,000 was in some places the river was pretty narrow and if you put a lock in there you restrict the stream, and might cause trouble with the flow, so there should be some margin

of safety for such contingency, and still maintain the natural flow capacity of the stream. It is no more than a normal factor for safety.

2341 Q. You only made a very cursory examination didn't you, you wouldn't have anyone invest money on that basis?

A. No, I would not, sir, but I would guarantee it would not be more than 25% less than that under present conditions.

Q. As an engineer you wouldn't advise the Government to build a dam as low as the London and Marmet on as heavy a basis as those dams are built, would you, powerful, up on the New River?

A. Well I don't think those on New River would cost as much per foot of lift for the reason we are dealing with smaller quantities of flow.

Q. As I get it, you made your trip as you described it here, and then from your experience in Chicago and elsewhere, you estimated the value or cost of building these navigable dams only up the New River?

A. My answer applies to navigation dams only, but is based on a good deal more than you mentioned. It is based on not only this hurried trip over the river, but a study of all available maps and profiles and such reports as might apply to that class of construction and my experience in studying projects elsewhere.

Q. When you were along the river did you notice that the clearing away of the road-bed for the various railroads had caused rock and debris to be thrown down into the river?

A. I could see the railroads had a bank very close to the river, but whether it actually encroached on the original lines or not I had no way of telling.

Q. Do you know how far the headwaters of the New River are from the headwaters of the Tennessee River, the Holston?

A. No, I don't. Fairly close I would say, but I don't know.

Q. You stated that the river was frequently interrupted by obstructions, you were not making that statement from the stretch from Hinton up to the Buck dam, were you?

2342 A. Yes, sir; I was.

Q. That is the stretch I thought you had not been (interrupted)

A. From Hinton?

Q. I should have said Radford.

A. That statement was based on the mile by mile survey and not exclusively on observation.

Q. Can you show me in your mile by mile survey where there is low water, less than nine inches, going over the shallows from Radford up to Allisonia?

A. You can't tell from the mile by mile survey how many inches of water or what the depths are over the rapids and falls.

Q. Didn't Major Craighill in his report state it was about a foot in low water down over these shallows?

A. He may have. I don't recall that.

Q. If he did say that, then wouldn't you say that there would be navigability for boats over those shallows?

A. No; I would not.

Q. Why not?

A. Because as I said before I interpret navigability to include substantial use by boats carrying commerce and trade, and I can't conceive of boats carrying commerce and trade on a twelve-inch channel over rapids and falls.

Q. Do you consider logging and rafting navigation?

A. I would not. You have no control over that class of movement of goods.

Q. Did you know that there has been testimony here that millions of feet of lumber were floated from Hinton down to Charleston or down to what they call the gorge near Charleston?

A. No, sir.

By Mr. JACKSON. I object to that. There is no such testimony in the record.

By Mr. THOMPSON. Do you say there was no such testimony?

By Mr. JACKSON. Not that I heard of.

By Mr. THOMPSON. Mr. James testified to that effect.

2343 Q. Did you know when the C. & O. Railroad was being built in what is known as the gorge, that the materials, much of the materials being used on that road, were transported by boat from Hinton down the river?

A. No; I didn't.

Q. Would that affect your judgment as to whether New River was navigable?

A. I would have to inquire further into the conditions under which that stuff moved and as to whether it actually moved.

Q. If you actually found in your inquiry it did move down the river and was unloaded at Sandstone Falls and reloaded and carried further down the river, and then moved on the railroad, would that affect your judgment?

A. I can't very well make an estimate of navigability of that section of the stream on such slight information as I am getting now.

Q. What information did you have when you formed your judgment as to nonnavigability?

A. All the Government reports which I read into the record this morning, plus what I actually observed as a matter of my recent check on river conditions compared with those obtaining in the early days.

Q. Do you recall that Government reports do report that materials were floated down the river for the construction of the C. & O. Railroad?

A. I don't recall that.

2344 By Mr. THOMPSON:

Q. When you assumed, as I understood it, that decrease in the flow at the head of London pool would not cut navigable depths below 9 feet, at mile 90.5 you did not consider the possibility of a surge or oscillation below the normal pool level, did you?

A. I did not take any possible surges or oscillation into consideration in any of my replies that I made this morning.

Q. If there had been a discharge down from the London pool to the Marmet of, let us say, 6,000 second-feet, and it was suddenly cut off, would there be oscillation in the Marmet pool, in your opinion?

By Mr. JACKSON. We object to the question because it has no relation to the examination in chief and is not proper cross-examination.

By Mr. THOMPSON. I object to his guiding the witness.

By the COURT. I do not think that he is guiding the witness. Read the question. [Question read.]

By the COURT. Mr. Jackson, you examined this witness, did you not, about the decreasing and increasing depths in the pool?

By Mr. JACKSON. At certain rates per hour with a limitation, when the flow was never reduced below the amount which would maintain pool levels, or would be sufficient to meet lockage, leakage and evaporation, but this question refers to completely cutting off the water.

By Mr. THOMPSON. I understood that Mr. Jackson referred to a drop as much as 2 feet in the pool below, and he asked if they kept the pool level the same, whether there would be any effect on navigation.

By the COURT. I understood him to inquire about it, and to state if they kept the pool level at least up to its minimum depth.

By Mr. THOMPSON. I do not see how that could happen unless there was a change in the flow of the river.

By Mr. JACKSON. But not cutting off the flow entirely.

By the COURT. He may answer the question.

Defendant excepts.

By Mr. JACKSON. Read the question. [Question read.]

A. I do not know whether there would be oscillation or not.

By Mr. THOMPSON:

Q. If the flow from London to the Marmet dam was diminished, 2,500 second-feet in an hour, would that cause any oscillation in your opinion in the Marmet dam pool?

A. I made no study of the effect of oscillations or how they might be produced in those pools, so I cannot answer that question.

Q. So, as I get it, for the record, in all of this testimony which you gave this morning, you were not referring in any way to any effect that might produce oscillation.

A. No, sir; and if you will remember, I put in somewhere to this effect that they must keep up the level of the pool, if what I said were to apply. You could not have a level pool, as I see it, if you had oscillation, that is, if you had oscillation it might go below the level of the pool.

Q. As an expert engineer on the question of flow of streams, &c., will you not state, or will you state whether or not the cutting off of 2,500 second-feet from the London to the Marmet dam inside of an hour would create oscillation in the Marmet pool?

2345 A. I cannot say because, as I said before, I have not studied all the characteristics of the London and Marmet pools in sufficient detail to answer the question.

Q. Would you say the same thing in regard to the Winfield and Gallipolis dams?

A. Yes, sir.

Q. You said navigators accommodated themselves to the conditions of the river, I believe, this morning?

A. Probably words to that effect, yes, sir.

Q. Do you consider it the duty of a navigator to be on the watch for changes in the flow of the stream due to the discharges from a power plant?

A. If he has public notice that the power plant is there, then for his own protection he would be wise to carry on his operations in such a way that he will not be caught in difficulty.

Q. I did not ask you whether it was a wise thing for him to do if he knew about it, but is that his duty on a navigable river?

A. You are now getting into a question of law there that I would not be able to answer.

Q. Suppose you were a navigator and going up the river and a fog struck you and you had to spar in at some place as rapidly as possible, would you feel it was your duty, notwithstanding that the power plant, let us say, was going to cut off the discharge, and drop the stage, let us say, two feet in an hour?

A. I wouldn't say it was my duty, but it would certainly be a thing that I would look out for.

Q. Now your only answer to my question is that it is up to the navigator to look out for himself on the river, even though this discharge may come.

2346 A. As a matter of practical operation he should watch out for all these things.

By Mr. THOMPSON:

Q. Then as I understand it, you were not testifying as to the fluctuations caused by a power plant, on navigation?

A. There was no specification as to the agency which caused these fluctuations, that I discussed this morning.

Q. Can you give any instance of any river fluctuating two feet in an hour from natural causes?

A. The Kanawha River itself has done that on the rise.

Q. But that was during some very high floods, wasn't it?

A. The discharge was in the water, 65,000 second-feet, at those particular times, when the change in stage was 2.6 feet.

Q. That was during the flood, but do you know whether a storm would break over a watershed and it would rise, say the Kanawha, that there would be a rise of two feet?

A. I imagine that these discharges that I just referred to were the result of storms of sufficient intensity to produce such a rise. However, I am not quite sure that I understand you.

Q. I must have misunderstood your examination this morning, because I understood you were referring to discharges produced by artificial conditions, but as I understand you now

2347 these discharges you spoke of were produced by natural conditions?

A. No, sir; I said the agency that produced these fluctuations were not discussed this morning.

Q. Do you know in any normal times that any storm has produced on any river a fluctuation of two feet within an hour?

A. It depends on what is meant by normal. This illustration I gave is a flood condition. By normal do you mean somewhere about mean stage of the river?

Q. Yes, that is it.

A. No, I don't know of any.

Q. You said navigators easily adjusted themselves to a six inch fluctuation in the pool level. Fluctuations of 1½ to 2 feet are more serious, are they not, than six inches?

A. As long as the pool is not below project depth, they are no more critical, until you get up to the critical discharges I mentioned this morning.

Q. When they are repeated several times daily, they are more serious, are they not?

A. They are not serious until you get up to a point where the velocity of flow is such as I stated this morning, until the velocity of flow gets up to that.

Q. Are these fluctuations of more than 1½ to 2 feet not productive of oscillations in the pools below?

A. I don't know, I did not study oscillations.

Q. I believe you testified this morning, or what was it you testified to as the amount of water necessary for lockage at the London and Marmet dams?

A. With reference to navigation on the Kanawha the testimony was to the effect that if the flow were reduced to 200 second feet there would be no adverse effect on navigation, and I explained specifically, because the water available would be sufficient
2348 for lockage, leakage and evaporation for existing commerce; but there was an assumption that was put to me on that, assuming that the old dams had been replaced by new ones in the lower river.

Q. Do you know that there is an allowance of 250 second feet in the arrangement between the Government and the Kanawha Valley Power Co. for lockage and leakage on the Kanawha, on the London and Marmet dams?

A. No, I do not.

Q. Would you knowingly advise a client to expend millions of dollars on the London lock and dam and then permit the water supply to be reduced so that its full capacity could not be utilized?

A. I don't think I would.

Q. You spoke about a condition that will exist when the Gallipolis dam is completed?

A. Yes, sir.

Q. And that there was a certain amount of wat[illegible] there that would be used for lockage and leakage, I believe [illegible]ery little for leakage, mostly for lockage?

A. I stated that 960 feet per second would be necessary for lockage if we allowed 48 lockages a day of 2,500 tons a piece.

Q. Do you know that there have been quite a number of occasions when the flow in the Kanawha River during low water periods, into the Ohio, at Point Pleasant, had been greater than the flow from above Point Pleasant from the Ohio?

A. No, I do not.

Q. If you allowed simply 250 second feet during very low water periods for lockage on the Kanawha River, and you had a low water condition such as existed in October 1930, and the Ohio, and also existed in 1925, what would happen with regard to the dams below Gallipolis dam if they only had the flow that was coming through from the Gallipolis dam?

2349 A. I do not think I could answer that question because I don't know what the actual figures are as to the flow in the Ohio River at those particular times.

Q. You know the dams below the Gallipolis dam are wicket dams and they have to be caulked and needled, don't you?

A. Yes, sir.

Q. When the water gets low that becomes a very important matter with respect to navigation on the river, does it not?

A. That becomes important whenever the leakage will approximate the low water flow.

Q. And does that situation ever arise?

A. I have known in several seasons where they had to needle these dams and caulk them pretty well.

Q. Isn't it a fact they have to do that every year and at certain periods of the year?

A. We had not had so much trouble with low water then as they probably have had since.

Q. So your testimony here today goes as far as the Gallipolis dam and not beyond?

A. It does not go beyond the Gallipolis dam.

Q. You do not pretend to say what the effect on such conditions would be below the Gallipolis dam?

A. I do not.

By Mr. THOMPSON:

Q. I understood you to say before recess that the fluctuation on the Kanawha River of 2,500 second feet was not material to navigation on any of the pools. Am I correct in that understanding?

A. Not entirely correct. I qualified that by stating if the project pool level was maintained.

Q. Suppose that the project pool level were maintained and there was a fluctuation of 8 or 9 thousand second feet, what would you say?

A. Above or below a certain given elevation of pool,
2350 That might be there at that particular time?

Q. Yes, sir.

A. I would say that might be serious.

(Exhibit 88, being Declaration of Intention of New River Development Company dated June 25, 1925, having earlier been offered by plaintiff for a limited purpose, was offered in evidence by defendant for all purposes.)

(Exhibit 90–A, being maps accompanying Application for License dated August 30, 1936, having earlier been offered by plaintiff for a limited purpose, was offered in evidence by defendant for all purposes.)

(Exhibit 568, being letter dated July 1, 1925, from O. C. Merrill, Executive Secretary of Federal Power Commission, to Mr. C. Bascom Slemp, was offered in evidence as a part of the course of the proceedings between defendant and the Federal Power Commission.)

(Exhibit 569, being letter dated July 3, 1925, signed by C. B. Slemp and addressed to O. C. Merrill, Executive Secretary of Federal Power Commission, was offered in evidence as a part of the course of proceedings between the defendant's predecessor, and the Federal Power Commission.)

(Exhibit 570, being letter dated October 24, 1925, addressed to Federal Power Commission and signed by Curtis, Mallet-Prevost, Colt & Mosle, was offered in evidence to show part of course of conduct by defendant's predecessor.)

(Exhibit 571, being letter dated October 24, 1925, addressed to Major General Harry Taylor, Chief of Engineers, War Department, and signed by Curtis, Mallet-Prevost, Colt & Mosle, was offered in evidence as a part of the proceedings between defendant and plaintiff.)

(Exhibit 510, being letter dated February 5, 1927, from Major Trippe to F. W. Scheidenhelm, was offered in evidence.)

(Exhibit 511, being letter dated February 4, 1927, from F. W. Scheidenhelm to Major Trippe, was offered in evidence.)

2351 Mr. ABBOT. On day before yesterday notice was given for the making of the motion with reference to the taking of the deposition of Colonel Ardery.

(The motion was duly filed.)

Mr. ABBOT. I have an order which I desire to present on that motion, which is as follows:

ORDER

"The defendant, pursuant to Federal Equity Rule 47, having filed its verified motion for the purpose of taking the deposition of Lieutenant Colonel E. D. Ardery, Engineer, Fifth Corps Area United States Army, Fort Hayes, Columbus, Ohio, and good and exceptional cause having been shown by the defendant for the taking of said deposition at the time and place hereafter set forth.

"It is ordered that the defendant be and it hereby is authorized and permitted to take the deposition of said Lieutenant Colonel E. D. Ardery before Kenneth L. Sater, a Notary Public, in and for Franklin County, Ohio, at the office of Sater & Sater, 50 East Broad Street, Columbus, Ohio, on August 28th, 1936, beginning at 11 o'clock in the fore noon of said day with respect to the following matters:

"(*a*) Whether or not power waves from the Byllesby and Buck Hydro Stations during the years 1927–30 caused any interference with navigation on or the navigable capacity of the Kanawha River.

"(*b*) Whether or not during the power wave test conducted during March 1930 there was interference with navigation on or the navigable capacity of the Kanawha River and whether or not there was interference with the operation of the navigation works, and

"It is further ordered that the defendant be permitted to apply to the United States District Court for the Southern District of Ohio, Eastern Division or to such proper officer as the defendant may be advised for a subpoena to compel the attendance of said Lieutenant Colonel E. D. Ardery at the time and place aforesaid."

The COURT. That is for Friday, is it?

Mr. ABBOT. Yes, sir. Lieutenant Colonel Ardery has stated that he will give his deposition on that day.

(Above mentioned Order was signed by Hon. John Paul on August 26, 1936.)

2352 LIEUTENANT COLONEL ARDERY—STIPULATION

Mr. THOMPSON. If the Court please: Yesterday your Honor entered an order permitting the taking of the deposition of Colonel Ardery, at Columbus, Ohio.

I have consulted with my associates since the adjournment last evening, and learn that the trip is about a thousand miles, going and returning, and I may say that so far, at this stage, we do not know how Colonel Ardery would answer the two questions that are to be propounded to him under the order—that is, the questions A and B—but in order to avoid taking this trip, and in view of the fact that our position has been that there was no evidence introduced to show that the wave from Buck and Byllesby dams did affect navigation down the river, but that they were introduced to show how the wave went down the river and how far it went, we are prepared to stipulate, although, as I say, we do not know how he would answer, we are prepared to stipulate that with regard to A as follows: That Col. Ardery would testify that the power waves from the Byllesby and Buck dams, from 1927 to September, 1930, inclusive, did not cause any interference with navigation on or the navigable capacity of the Kanawha River.

We are further willing to stipulate as to B that, during the test of the power waves in March 1930, that Col. Ardery will testify that there was no interference with navigation on or the navigable capacity of the Kanawha River, and there was no interference with the operation of the navigation works.

I have read the two questions which are to be propounded to him. We would, of course, want it understood that we are not by this statement (the Government is not) admitting that those
2353 waves did not affect navigability or navigation down the Kanawha River, and we are offering this stipulation on the condition that we will not have to take the deposition.

Mr. JACKSON. Of course, I would want it stipulated further that Lieutenant Colonel Ardery was, at the time (that is 1927–30) and at the time of the power wave tests in March 1930, the District Engineer of the Corps of Engineers of the United States Army in charge of the Huntington District and in charge of the Kanawha River and navigation works on the Kanawha River and their operations, and also on certain parts of the Ohio River.

Mr. THOMPSON. This does not go to the Ohio River. It runs to the Ohio, but does get in it.

Mr. JACKSON. The Huntington District includes to the mouth of the Kanawha and a certain distance down the Ohio River.

Mr. THOMPSON. We will agree to that, but we also want it understood and agreed to that Colonel Ardery was District Engineer and was there during all of this period that he speaks of.

My associates suggest that we are willing to stipulate that he was District Engineer during the time the official records show that he was such.

Mr. JACKSON. We haven't official records, but we are stipulating that he was District Engineer during that time.

Mr. THOMPSON. What time?

Mr. JACKSON. 1927–1930, inclusive, and particularly during the period of March, 1930, when the so-called tests were made with waves from the Buck and Byllesby plants.

Mr. THOMPSON. Will it be understood that his duty there expired in September, 1930?

Mr. JACKSON. Sometime in September; yes.

2354 Mr. THOMPSON. We stipulate that, your Honor.

Mr. JACKSON. And that these tests in March, 1930, were made in cooperation with his office as District Engineer?

Mr. THOMPSON. Do you mean cooperation with the defendant?

Mr. JACKSON. Yes; and others, and, so far as that is concerned, that he cooperated in making the tests.

Mr. THOMPSON. All right, we will stipulate that.

Mr. ABBOT. Shall that be put in the form of an order? I did not mean that there would be an order, but I think the record had better be read back.

Mr. JACKSON. I think it can be read back, or checked so if there is any error we can correct it.

The COURT. Will you please read it back?

NOTE.—The above was then read back.

Mr. THOMPSON. I would like to expunge from the record the motion that was made. The order is sufficient, it seems to me, to tie in the stipulation.

Mr. JACKSON. It is all a part of the record, Mr. Thompson.

Mr. THOMPSON. I know, but we are not admitting any part of that.

The COURT. I do not see any reason why it should be expunged from the record. It has been a part of the proceeding of the Court. If there is an appeal, or anything of that sort, you gentlemen might want it in the record, but we can omit any immaterial matters, but I think the record of this Court should show everything that happened.

Mr. THOMPSON. We are not conceding any of the statements set forth in the motion.

The COURT. No.

(Exhibit 573, being defendant's Exhibit 505 identified by Col. Edgerton as part of the minutes subsequently printed as the minutes of the meeting of the Federal Power Commission of June 1, 1927, was offered in evidence.)

(Exhibit 574–a, being letter of July 1, 1927, from Federal Power Commission to Curtis, Mallet-Prevost, Colt & Mosle, was offered in evidence.)

(Exhibit 574–b, being certified copy of the minutes of the 88th Meeting of the Federal Power Commission held on June 1, 1927, was offered in evidence.)

(Exhibit 574–c, being form of major license tendered for project on navigable waters by Federal Power Commission to Appalachian Electric Power Company, was offered in evidence.)

(Exhibit 575, being a letter dated March 1, 1928, to Hon. Dwight F. Davis, Secretary of War, Hon. Hubert Work, Secretary of Interior, Hon. William N. Jardine, Secretary of Agriculture, constituting the Federal Power Commission and signed for Appalachian Electric Power Company by Curtis, Mallet-Prevost, Colt & Mosle was marked for identification. Inasmuch as said letter was set forth in the Eighth Annual Report of the Federal Power Commission, contained in Exhibit 91, the defendant did not offer the document marked Exhibit 575 for identification but instead was granted leave to refer to the text of Exhibit 575 in Exhibit 91 as though the document originally marked Exhibit 575 for identification had been offered in evidence.)

(Exhibit 529, being letter dated February 4, 1930, from Appalachian Electric Power Company, by Curtis, Mallet-Prevost, Colt & Mosle, to Federal Power Commission, re minor part license, was offered in evidence.)

(Exhibit 530, being memorandum dated February 4, 1930, re minor part license, prepared by Curtis, Mallet-Prevost, Colt &

Mosle, was offered in evidence, for the purpose of showing what the memorandum was which accompanied Exhibit 529, and to show what kind of an application Appalachian Electric Power Company was making.)

(Exhibit 576, being letter dated March 5, 1930, to Lt. Col. M. C. Tyler, Chief Engineer of Federal Power Commission, and signed "F. W. Scheidenhelm", was offered in evidence.)

(Exhibit 531, being letter dated July 21, 1930, from Patrick Hurley, Chairman, Federal Power Commission, to Attorney General of the United States, requesting opinion re power of Federal Power Commission to issue minor part license, was offered in evidence.)

(Exhibit 577, being pp. 6, 7, 8 and 9 of the 10th Annual Report of the Federal Power Commission for the year 1930, was offered in evidence.)

(Exhibit 532, being opinion of Attorney General William D. Mitchell, dated September 22, 1930, re minor part license, was offered in evidence.)

(Exhibit 578–a, being letter dated October 3, 1930, to General Brown, Chief of Engineers, and signed by F. E. Bonner, Executive Secretary of Federal Power Commission, was offered in evidence.)

(Exhibit 578–b, being letter dated October 10, 1930, to the Executive Secretary of the Federal Power Commission signed for the Chief of Engineers of the War Department by Hugh J. Casey, First Lieutenant, Corps of Engineers, was offered in evidence.)

(Exhibit 533, being letter dated October 6, 1930, from Appalachian Electric Power Company, by Curtis, Mallet-Prevost, Colt & Mosle, to Federal Power Commission, requesting action on part of Commission in light of Attorney General's opinion, was offered in evidence.)

(Exhibit 536, being letter dated October 31, 1930 from F. E. Bonner, Executive Secretary of Federal Power Commission, to Appalachian Electric Power Company, including draft of minor part license, was offered in evidence.)

(Exhibit 537, being letter dated November 6, 1930, from F. E. Bonner, Executive Secretary of Federal Power Commission, to Appalachian Electric Power Company, c/o F. W. Scheidenhelm, including revised draft of minor part license enclosed therein, was offered in evidence.)

(Exhibit 542, being letter dated November 8, 1930, addressed to Federal Power Commission from F. W. Scheidenhelm, notifying Federal Power Commission that Appalachian Electric Power Company will accept minor part license, was offered in evidence.)

(Exhibit 579–a, being letter dated November 5, 1930, addressed to Executive Secretary, Federal Power Commission, and

signed by Lytle Brown, Major General, Chief of Engineers, was offered in evidence.)

(Exhibit 579–b, being copy of report entitled "Second Endorsement U. S. E. O. Huntington W. Va. October 18, 1930—to the Division Engineer Upper Miss. Valley Division, St. Louis, Mo." was offered in evidence.)

(Exhibit 579–c, being report on question of navigability of New River, Virginia (Huntington District, August 29, 1930) Third Endorsement Office Division Engineer Upper Miss. Valley Div. St. Louis, Mo. October 24, 1930 to Chief of Engineers United States Army, Washington, and signed by George R. Spalding, Lt. Col., Corps of Engineers, was offered in evidence.)

(Exhibit 535, being letter dated November 7, 1930, from Col. Kingman to Executive Secretary of Federal Power Commission regarding clause in license for discharge of water at Radford Dam, was offered in evidence.)

(Exhibit 538, being letter dated November 8, 1930, from F. E. Bonner, Executive Secretary of Federal Power Commission, to General Brown, Chief of Engineers, requesting opinion on navigability of New River, was offered in evidence.)

(Exhibit 580, being memorandum dated October 21, 1930, entitled "Memorandum for Executive Secretary" and signed by J. F. Lawson, Acting Chief Counsel, was offered in evidence as one of the documents transmitted to the Chief of Engineers with Exhibit 538.)

(Exhibit 541, being memorandum dated October 28, 1930 for the Executive Secretary of the Federal Power Commission prepared by Colonel Tyler, Chief Engineer of Federal Power Commission, re minor part license application, was offered in evidence as one of the documents transmitted to General Brown, Chief of Engineers, with Exhibit 538.)

(Exhibit 581, being memorandum for the Secretary of the Interior, Acting Chairman of Federal Power Commission, and signed by F. E. Bonner, Executive Secretary, dated October 30, 1930, was offered in evidence, as one of the documents transmitted to General Brown, Chief of Engineers, with Exhibit 538.)

(Exhibit 539–a, being letter dated December 15, 1930, from F. E. Bonner, Executive Secretary of Federal Power Commission, to Curtis, Mallet-Prevost, Colt & Mosle, enclosing report of General Brown, was offered in evidence.)

(Exhibit 539–b, being letter dated November 11, 1930 from General Brown, Chief of Engineers, to Federal Power Commission, re non-navigability of New River, was offered in evidence.)

(Exhibit 582, being letter dated November 8, 1930 to John G. Pollard, Governor of Virginia, and signed by F. E. Bonner, Execu-

ve Secretary, Federal Power Commission, was offered in evi-
ence.)

(Exhibit 583, being letter dated November 10, 1930, Governor
G. Pollard of Virginia to F. E. Bonner, Executive Secretary
f Federal Power Commission, was offered in evidence.)

(Exhibit 540-a, being letter dated November 28, 1930 from
. E. Bonner, Executive Secretary of Federal Power Commission,
Appalachian Electric Power Company, re meeting of Federal
ower Commission of November 25, 1930 was offered in evidence.)

(Exhibit 540-b, being certified copy of minutes of meeting of
ederal Power Commission of November 25, 1930, re action on
inor part license application of Appalachian Electric Power
ompany, was offered in evidence.)

(Exhibit 584, being letter dated January 27, 1931, from Curtis,
allet-Prevost, Colt & Mosle, to Federal Power Commission re
earing to be held on Radford Project, was offered in evidence.)

Exhibit 585, being telegram dated January 28, 1931, from Federal
ower Commission, signed by Geo. Otis Smith, Chairman, ad-
ressed to Appalachian Electric Power Company, was offered in
vidence.)

(Exhibit 525, being the report of Colonel Spalding, dated
ebruary 24, 1932, to Chief of Engineers, was offered in evidence.)

(Exhibit 509, being letter from Secretary of War dated
ebruary 25, 1928 transmitting report from the Chief of Engi-
eers on preliminary examination and survey of Kanawha River,
Vest Virginia, House Document No. 190, 70th Congress, 1st
ession, 1928, was offered in evidence.)

(Exhibit 586, being letter dated September 18, 1934, to Secre-
ary of War, and signed by Appalachian Electric Power Com-
any, was offered in evidence to show position and intent of and
ction taken by the defendant.)

(Exhibit 587, being letter dated October 9, 1934 to Appalachian
lectric Power Company, and signed by G. H. Dern, Secretary
f War, was offered in evidence.)

(Exhibit 588, being letter dated October 18, 1934, from Appa-
achian Electric Power Company to George H. Dern, Secretary
f War, was offered in evidence to show position and intent of
nd action taken by the defendant.)

(Exhibit 589, being letter dated September 18, 1934 to Frank R.
IcNinch, Chairman of Federal Power Commission, signed by
ppalachian Electric Power Company, was offered in evidence
o show position and intent of and action taken by the defendant.)

(Exhibit 590, being letter dated October 19, 1934 to Frank R.
IcNinch, Chairman of Federal Power Commission, from Appa-
achian Electric Power Company, was offered in evidence to show
osition and intent of and action taken by the defendant.)

(Exhibit 591, being letter to M. F. Millikan, American Gas & Electric Company, signed by G. W. Lineweaver, dated October 23, 1934, was offered in evidence.)

(Exhibit 572, report of General Taylor, Chief of Engineers, dated December 29, 1925 to O. C. Merrill, Executive Secretary of Federal Power Commission, having previously been received in evidence for a limited purpose, was reoffered and received in evidence for all purposes.)

2355 S. M. YARBRO on Direct Examination testified as follows:

I live at Charleston, West Virginia. I am assistant construction engineer for the Kanawha Valley Power Company. I am at present occupied at Winfield, West Virginia.

I took some photographs on New River, on June 2nd, 1936. I didn't take them myself, but I accompanied the professional photographer. The photographer's name was Mr. R. Nunnally. Those photographs were taken on June 1st, 2nd, and 3rd, at Goodwin's Ferry, above Eggleston, Virginia; Round Bottom Creek, above Glen Lyn. The photographs on June 1st were taken from Glen Lyn to Round Bottom Creek. On June 2nd the majority of the photographs were taken from Narrows, Virginia, to Ripplemead, Virginia. On June 3 the photographs were taken from Eggleston, Virginia, to Pembroke.

Q. Mr. Yarbro, I hand you an album marked "Defendant's Exhibit No. 592," in which there appears a map showing the locations of certain photographs by number, and a series of photographs from 61 to 113, both inclusive, and I will ask you if those are the photographs which you have just mentioned?

A. Yes; they are.

Q. Does each one of those photographs fairly portray the situation that appears at the place and time mentioned under the bottom of these photographs?

A. Yes.

Mr. ABBOTT. If your Honor please, I now offer in evidence "Defendant's Exhibit No. 592," and with reference to the map in the beginning of it I will state that it is not being offered as evidence as to the State or County lines. That is all we wish to ask. (Exhibit 592 introduced in evidence.)

The witness on Cross-Examination testified as follows:

I was present when all of these photographs were taken. We took them on June 1st, 2nd, and 3rd and some on June 29th also.

2356 I was instructed to take the pictures by my immediate superior. I believe he said that they were to be used in this suit. We went back on June 29th, because some of the pictures that we took on June 1st, 2nd, and 3rd were not very good, and we took the same pictures over again. I do not recall which ones were not good.

Q. What was the instruction that you had about taking the pictures?

A. Well, I was instructed to take pictures of the Rapids and falls between the points I have mentioned.

Q. The rapids and the falls?

A. Yes, sir.

Q. And they did not tell you to take any pictures of the pools?

A. No, sir.

Q. So what you did was to take pictures which would detail as much as possible the rapids and falls?

A. That is correct.

Photograph No. 111 is one we took on the 29th of June. I do not believe that we had taken that particular scene before. I was not sent back because I had missed scenes or views. They sent me back because some of the pictures did not show clearly; some were sun struck or light struck. They did not show the condition of the river. This picture (No. 111) was not taken before, because we missed this part of it. In driving down the road in an automobile we did not see it. I believe we removed all the pictures that were light struck. I selected the sites which I photographed. I had lived in the vicinity about ten years, and I know the river along in that section.

Q. What was the condition of the river when you took the photographs on June 1st, 2nd, and 3rd?

A. In the elevation of the river?

Q. Yes; the elevation of the river?

A. It was considered normal.

Q. Normal?

A. Normal elevation.

Q. Do you mean by "normal low water" the average flow?

2357 A. Average flow.

Q. Average flow?

A. Yes, sir.

Q. Did you learn that simply by observation, or did you happen to look up the gage station records?

A. Gage station records.

Q. And what was the flow say at Round Bottom Creek on June 29th?

A. I can tell you what it was at Glen Lyn steam plant of the Appalachian Electric Power Company. I can give the elevation of the river.

Q. What was it?

A. 1492.5. I believe that is the elevation, but I can't say positively.

Q. What was the stream flow?
A. I don't know what that was.

By the COURT:

Q. Where was that point?
A. That was at Glen Lyn Steam Station.

By Mr. THOMPSON:

Q. What is the number of your picture at Glen Lyn?
A. We don't have one right at Glen Lyn.
Q. What was your nearest to Glen Lyn? 97 or 8, they say; have you got those?
A. Yes, sir.
Q. You say you don't know what the second feet in flow was at that time?
A. No, sir; I do not.
Q. So really your statement about the amount of water in that river is simply your estimate by eye, isn't it?
A. My statement about the amount of water in the river meant that the elevation of the river on those days was what was considered normal by the Government gage. There is a gaging station at Glen Lyn.
Q. Did anybody say that that was the normal, or is that something you have learned?
A. Well, I understand that that elevation is fixed as normal flow by the Government.
2358 Q. And who in the Government told you that?
A. Well, I was informed that that was considered normal by the officials of the plant.
Q. That is hearsay. The officials of the plant?
A. Yes, sir.
Q. And the plant is the plant of the Appalachian Electric Power Company, isn't it?
A. Yes, sir.
Q. You did not attempt in all instances here to get the full river; what you were trying to get was shoals?
A. That is it.
Q. Were you taking just cross river views?
A. We took them from the best angle.
Q. From the best angle to show up the shoals?
A. Yes, sir.

I live at Charleston, West Virginia. I lived at Glen Lyn on New River from 1925 to 1931. From 1931 to 1934 I was at Narrows.

The condition of the river on June 2, 1936, when Photograph No. 61 was taken, was the same as the condition that prevailed when the other photographs were taken. I would say that this

photograph was made about 3:00 in the afternoon. When Photograph No. 62 was taken we were standing on the bank of the river but the photographer had his camera elevated too high to get the bank. I think he had a Graflex camera.

The witness, recalled for further Cross Examination, testified as follows:

I covered a distance of about 36 miles in taking these pictures on the river. I never counted the number of shoals we took pictures of.

Q. Do you know what the distance was that the shoals covered of the 36 miles?

A. How is that, now?

Q. The distance up and down stream that those shoals covered of the 36 miles?

2359 A. No, sir; I do not.

Q. If I were to say it was five miles out of 36, would you agree with that?

A. I really have no information at all on that.

Mr. ABBOT. I object to the question. The witness says that he doesn't know.

The COURT. Objection overruled.

Mr. ABBOT. Exception.

By Mr. THOMPSON:

Q. Would you not say that it was over five miles?

A. I merely had these pictures taken, but I have never measured the distance and have no idea at all what distance they cover.

Q. And you took the worst conditions of the river in the 36 miles, didn't you?

A. Well, I took the shoals and the rapids.

Q. And they are the worst conditions in the river, are they not?

A. What do you mean by "the worst conditions?"

Q. I mean the obstructions on the river—the greatest obstructions in the river or in that section?

A. Yes, sir.

I did not notice any channel in the river when I took photographs Nos. 61, 62, 63 and 64. Those pictures, Nos. 61, 62 and 63, were taken near Eggleston, Virginia.

Photographs Nos. 62, 63, 64, are all at about the same place in the river.

Photographs Nos. 65, 66, 67, 68, 69, 70 and 71, inclusive, were all taken within a distance of about a mile. They were not all taken of one shoal. There is a shoal for each picture except 69 and 70 are of the same shoal.

Q. What do you mean by a shoal?

A. Well, it is swift water, where water falls over an obstruction, such as projecting rocks.

Q. It is more than one particular ledge running across the river, isn't it?

A. It could be.

Q. Haven't you a series of ledges within a very short distance, that are practically all one shoal?

A. These pictures you have referred to are within a radius of about a mile, and that is all swift water in there.

2360 Q. They were taken about as closely as they could be taken, in order to get different views of the river?

A. Well, they were taken to show these shoals up to the best advantage.

Q. And by "the best advantage" you mean by showing them up as outstanding as possible, do you not?

A. Well, when we took these photographs we attempted to show the river as nearly the true condition as we could. I would not say that we tried to show the river as rough as possible, but tried to make a true picture.

Q. You were trying to make a true picture of the shoals?

A. Yes, sir.

Q. And that was the roughest part of the river at that particular place?

A. Yes, sir.

Q. And you said yesterday, I believe, you were not trying to take pictures of the pools above and below?

A. No; we paid no attention to those.

72, 73 and 74 are not of the same place exactly. They follow one after the other. 72, 73, 74 and 75 are from 4.1 miles below Eggleston to 4.7 miles.

Q. So you have a very close area there in which you took this series of pictures?

A. That is right.

Q. That is correct, is it?

A. Yes, sir.

Q. While you show these, are you familiar with the Hutton Survey?

A. No, sir.

Q. You don't know that the Hutton Survey shows that is only four-tenths of a mile instead of six-tenths, as you have it?

A. No, sir.

Q. Did you not know that the stretch where you were, or did you know that the stretch where you were taking pictures had

been surveyed and that there was a channel there 16 feet
2361 wide, 2.3 feet deep? Let us take, for example, the reference back to Photograph No. 72: That looks like fairly rough water there, doesn't it?

A. Yes, sir.

Q. Did you know that there was a channel there 16 feet wide and 2.3 feet deep?

A. No, sir.

Mr. ABBOT. We object to that question. There is no evidence in this record of any such channel.

The COURT. I don't recall any testimony along that. He can answer it.

Mr. ABBOT. Exception.

By Mr. THOMPSON:

Q. Did you know that there was a channel at No. 78 that is 30 feet wide and 3 feet deep?

Mr. ABBOT. We make the same objection.

The COURT. Overruled.

Mr. ABBOT. Exception.

A. No, sir; I didn't know that.

By Mr. THOMPSON:

Q. And that the same condition existed at 79, 80, and 81?

Mr. ABBOT. The same objection.

The COURT. Where is the evidence of the present existence of a channel at that place?

Mr. THOMPSON. We have the testimony of Mr. Gerdes and those that went over it in a boat that there was a channel of this width and depth. They went there this summer and made the trip.

The COURT. I remember that they made the trip, but I don't remember the other.

Mr. THOMPSON. Yes, sir. The answers to my questions were as to specific widths and depths, and that they actually measured the depths and got out in the water.

Mr. ABBOT. If your Honor please, my recollection of Mr. Gerdes' testimony is not that he measured any channel lengthwise in the river, but when his experienced eye showed it was a critical point, then he measured across the river. There was no lengthwise measurement of any channel at any point.

Mr. THOMPSON. If there is any question about that we will have reference to his testimony.

The COURT. Answer the question.

Mr. ABBOT. Exception.

Note: The last two questions asked were read.

By Mr. THOMPSON:

Q. You didn't know that?

A. No, sir.

Photographs Nos. 78, 79, 80, and 81, inclusive, are located close to each other, they are not identical.

2362 Photographs Nos. 85 and 86 were taken of the same place on the river, but one is taken closer up than the other.

Q. I believe you testified yesterday that you were told by representatives of the Appalachian Electric Power Company, at Glen Lyn, that the stream flow on the days that you took these pictures was about normal?

A. That is correct.

Q. Do you know what they said the flow was, how much it was, on any one of those days?

A. Do you mean the elevation of the river, or second-feet?

Q. Second-feet?

A. I do not.

Q. Have you tried to find out since yesterday?

A. No, sir.

Q. Did you know that there was a variation in flow from 1700 to 2500 second feet during those days?

A. No, sir.

Q. There was not any storm on the river on those particular days, was there?

A. Not at the point where we took the pictures.

Q. You did not hear of any storm upstream?

A. No, sir.

Photographs Nos. 87, 88, 89, 90, 91, 92, and 93, inclusive, were all taken above Bluff City, and approximately within one-half mile of each other.

Photographs Nos. 103 and 104, were taken of the same spot in the river, 4.5 miles below Glen Lyn. 102 is not the same spot.

Photographs Nos. 109, 110, 111, and 113, inclusive, are all pictures of the river at Round Bottom Creek. There were indications that a Creek came into New River at Round Bottom, but there is no creek there now.

We took a great many photographs we didn't put in this Album.

Photographs Nos. 106, 107 and 108, inclusive, are views of
2363 Wylie's Falls, taken at practically the same place.

I have crossed the river several times in boats.

(Exhibit 250, being photograph No. 58 contained in album of aerial photographs of New River—exhibit 273 was marked for identification.)

(Exhibit 251, being photograph No. 56 contained in album of aerial photographs of New River—exhibit 273 was marked for identification.)

(Exhibit 252, being photograph No. 57 contained in album of aerial photographs of New River—exhibit 273 was marked for identification.)

I have heard the natives in the location of these pictures (107 and 108) say that at certain points there were channels, but no one has ever pointed out to me any channel there. If any channel was there no one has ever pointed it out to me, and I could not recognize it from looking at the river.

Defendant's exhibit 515 marked for identification is the same as No. 96 in Defendant's exhibit 592.

364 HAROLD A. THOMAS

Direct examination by Mr. JACKSON:

Q. Will you please state your full name and residence for the record?

A. Harold Allen Thomas. Pittsburg, Pa.

Q. What is your occupation?

A. I am a Professor of Civil Engineering at Carnegie Institute of Technology.

Q. Professor Thomas, will you please state what has been your education?

A. I spent six years at Columbia University, receiving the degree of A. B., in 1906, and Civil Engineer degree in 1908.

Q. State what has been your experience as a teacher since your graduation from Columbia University?

A. I spent a summer as instructor in Columbia University Surveying School. I taught a year and a half as instructor in Civil Engineering at the University of Washington, Seattle, Washington.

From 1910 to 1923 I was Professor of Civil Engineering at Rose Polytechnic Institute, Terre Haute, Indiana.

Q. What were you in charge of at Rose Polytechnic Institute?

A. Civil Engineering courses, and among them courses in Hydraulics and Hydraulic Engineering.

Q. Will you proceed?

A. Since 1923 I have been Professor of Civil Engineering at Carnegie Institute of Technology, Pittsburgh, Pa.

Q. Will you state what, if anything, your duties as Professor of Civil Engineering at Carnegie Institute of Technology had to do with hydraulics or hydraulic engineering?

A. I have charge of all courses in Hydraulics and Hydraulic Engineering, which includes the graduate courses in Hydraulic Engineering and the courses in Advanced Hydraulics.

2365 Q. Does that include Water-Power Engineering?

A. Yes, sir; that includes Water-Power Engineering. I am also in charge of the Hydraulic laboratories.

Q. Outside of your work as a teacher of Hydraulic subjects, have you had any experience in engineering of a hydraulic character?

A. I have had a considerable amount of experience of such kind.

Q. Will you briefly indicate something of your experience in engineering work outside of your teaching activities?

A. During the fall and early winter of 1908 I was a member of the Engineering Corps of the New York State Water Supply Commission, engaged in surveys for water power and flood protection on the Genessee River, New York State.

During the summer of 1918 I was Assistant Engineer of the Corps of the Great Northern Railroad, at Monroe, Washington, where a part of my duties were to make investigations of flood heights along the Snoqualmie River, Washington.

Q. Will you proceed?

A. In the years 1914 and 1915 I was Consultant for the Pennsylvania Railroad, in connection with damage from floods arising in the Wabash River and White River Valleys in Indiana.

During the summer of 1918 I ws Assistant Engineer of the Miami Conservancy District, Dayton, Ohio, where my duties were to make computations on the hydraulic behavior of the flood retarding reservoirs, and to prepare a report on the hydraulic features of the flood protection system for Dayton, Ohio, and other cities in the Miami Valley.

In 1927 I was Consulting Engineer for the City of Pittsburg on studies having to do with the design of walls along the river front to protect the city from floods, and I made studies to determine how the construction of those walls would affect flood water heights in the Pittsburg District.

2366 During the summer of 1928 I served as senior engineer in the U. S. Engineer office of the War Department at Philadelphia, Pa., having charge of a survey and investigation of the water resources of the Delaware River, for future embodiment in the so-called 308 report.

Beginning 1928 I served as Consulting Engineer for the Flood Commission of Pittsburg. That engagement has continued to the present time. My principal duties have been to advise the Flood Commission on matters pertaining to flood protection of the Pittsburg District, and particularly to review and report on studies of flood protection made by the U. S. engineers.

Q. That covered what different rivers?

A. Alleghany, Monongahela and Upper Ohio River below Pittsburg.

About 1928 I established the Hydraulic Research Laboratory at Carnegie Institute of Technology, and since that time that Laboratory has carried on a great many investigations by means of models to study the action of various hydraulic structures, particularly dams, spillways and river navigation structures, such as locks and dams. During that time the structures we have investigated have included some of the largest structures built in the United States in recent years.

Q. Has your work outside of your teaching included any work for the Corps of Engineers of the U. S. Army along hydraulic lines?

A. We have done a great deal of work in the Laboratory for the Corps of U. S. Engineers. They maintain an office at Carnegie Institute of Technology where they have six men at present cooperating with my men on studies of various structures.

Q. Has that got to do with hydraulics?

A. Yes, sir.

2367 Q. Will you name some of the U. S. Engineering offices for which you have done work as Hydraulic Consultant?

A. The Philadelphia office, the Pittsburgh office, the Huntington, West Virginia, office, the Mobile, Alabama, office and the Panama Canal Zone.

Q. Have those studies anything to do with currents in connection with structures in the rivers?

A. We have made a number of studies to determine the best method of eliminating or controlling dangerous cross currents in the vicinities of the entrances to locks at navigation dams on rivers.

By Mr. JACKSON:

Q. Please state a few of the navigation structures in regard to which you have made hydraulic studies of the character you have described.

A. We have made such studies on Lock and Dam No. 4, on the Monongahela River and Lock and Dam #9, on the Alleghany River; the Gallipolis Dam now under construction on the Ohio River; the New Emsworth Dam on the Ohio River, six miles below Pittsburgh, and we have made certain studies involving navigation at the Tuscaloosa Dam on the Warrior River in Alabama.

Q. In the course of those studies have you inspected or studied the actual operation of navigation locks and dams?

A. Yes, sir; I have had occasion to visit various locks and dams and in certain cases to make detailed surveys to show the direction and velocity of river current in the approaches to the navigation locks. I have also had occasion to observe the action of boats or tows moving in and out of locks, to determine how these were affected by river current.

Q. You stated you had studied, among other structures, the Gallipolis Dam. For what engineering office, if any, did you make that study?

2368 A. The Huntington office.

Q. Have you carried on any other studies of structures, involving hydraulic structures, for the Huntington office?

A. Yes, sir.

Q. Please state what they are.

A. During the past eight months we have been making very intensive studies of a number of models for the Bluestone Dam on the New River.

Q. Are you employed in any capacity with respect to the Bluestone Dam or the design of it?

A. Yes, sir; in addition to being in charge of the model studies at that dam, I am consulting engineer on the hydraulic design.

Q. Professor Thomas, are you the author of any technical or scientific articles on engineering subjects?

A. I have written a number of technical articles for engineering magazines.

Q. Can you name a few of them?

A. The Back Water Curve, published in Rose's Technic, back in 1915.

By Mr. THOMPSON:

Q. Is that a school or college?

A. Yes, sir; that was a school. I have also written short articles on methods of computing outflow from retarding reservoirs.

By Mr. JACKSON:

Q. Did you have anything to do with any report on the Miami Conservancy District?

A. I prepared the original manuscript for the technical report of the Miami Conservancy District on the subject of "Hydraulics of the Miami Valley Flood Control System."

I prepared the report of the Pittsburgh Flood Commission reviewing the 1928 report of U. S. Army Engineers on Flood Protection for the Pittsburgh District.

2369 I am the author of a bulletin published by the Carnegie Institute o. Technology on "Hydraulics of Flood Movements in Rivers."

Q. Are you a member of any professional or scientific society?

A. I am a member of the American Society of Civil Engineers; I am a Fellow of the American Association for the Advancement of Science; and I am a member of the Society for the Promotion of Engineering Education.

Q. Professor, have you any specialty in the field of hydraulics?

A. I have specialized in unsteady flows, irregular and fluctuating flow of water, particularly in rivers, and other open channels, studying such things as flood movements, flood waves or power waves or power tides, as we call them.

Q. What do you mean by river tides?

A. A condition in which the flow of the river increases and decreases alternately rather slowly. Though it is sometimes called river waves I think the term "tide" is more appropriate because the rise is gradual and the fall is gradual; because the thing resembles an ocean tide very much more than it resembles an ocean wave; for example, power tide in the river usually has a period of 24 hours, rising slowly and then receding slowly.

Q. Will you state a little more particularly what has been the nature of your specialization in connection with these river tides or fluctuating movements?

A. For many years I have been interested in the mathematical theory of unsteady flow in rivers and other open channels, and have done a great deal of work to develop mathematical methods of studying such action. I have also done a great deal of work studying the possibility of investigating such action by means of models, and I might say at the present time that the use of models is becoming a recognized method of solving all problems which are too intricate to be solved by strictly mathematical methods.

2370 Q. Have you employed these various methods, mathematical and model, in hydraulic work?

A. Yes, indeed; I employed both methods extensively.

Q. Are you familiar with the Kanawha River?

A. I have visited the Kanawha River, or the portion of it between Charleston and the mouth of Cauley River, particularly in the vicinity of the London and Marmet Dams.

Q. On those visits, have you observed any hydro-electric plants?

A. Yes, sir; I have visited the Marmet and London hydr-electric plants, spent considerable time in each plant, observed the method of operating the plant, and observed the automatic gauges which record the water level in the forebay, and tailrace, of those plants.

Q. Are you familiar with the hydraulic conditions along the Kanawha River between Charleston and Kanawha Falls, and the methods for observing or measuring the hydraulic behavior of the river?

A. Yes; I have had an opportunity to inspect the various maps of the Kanawha River and to see the rating curves and rating tables at the various gauging stations, and those are the principal things that would affect the hydraulic characteristics of the river.

Q. What did you say about the rating tables, or what about them?

A. I have seen data on discharge of river, both in the form of rating curves and rating tables.

Q. Have you at any time made any examination or inspection of the original chart of the automatic gauges?

A. Yes; I have inspected those charts of the automatic gauges for various periods during the past few months.

Q. Have you inspected any original records of Lock Gauges at any navigation locks and dams?

A. Yes, sir; I visited the dams at Marmet and London and observed the operation there personally.

2371 Q. Have you any acquaintance with New River?

A. I visited the Radford dam site and then visited various other portions of New River, such as I could reach by automobile, from Radford dam site to the mouth of the river.

Q. Did those portions of the river which you visited include Glen Lyn region or not?

A. Yes; I traveled by automobile from Glen Lyn down the bank of the river as far as Hinton.

Q. What, if anything, did your inspection and study of the Kanawha River and New River have to do with the present suit?

A. As far as the Kanawha River is concerned, I visited it on account of the present suit. In connection with New River I visited it both in connection with the present suit and because of my interest in the hydraulic design of the Bluestone Dam.

Q. Have you ever had occasion to visit New River in connection with the Bluestone?

A. No, sir; this was my first visit in that connection.

Q. Was your visit to the Bluestone Dam in connection with this suit or in connection with some other employment?

A. The trip was made for both reasons, to inspect in connection with this suit and also at the authority of Col. Conklin, to inspect the site of the Bluestone Dam.

Q. Who is Col. Conklin?

A. He is the District Engineer in the Huntington District.

Q. You mean of the U. S. Army Engineering District?

A. Yes, sir.

Q. Will you describe briefly the methods which are accepted and employed in determining river flow conditions?

A. The best method of studying river flow conditions is by means of tests on the actual river, if it is possible to make
2372 such tests. If conditions are such that it is impossible to make actual tests, one can have resort to mathematical methods; but in general those methods are apt to be so cumbersome and intricate as not to be workable. That is particularly true in the case of steep rivers, and when studying waves of duration as short as a day under those conditions it is almost impossible to solve the problems in a satisfactory way by a purely mathematical method on account of the great amount of labor and the great length of time involved in getting results.

Another method of studying such problems is to construct natural scale models of the river, showing all the curves and ledges. That method is not very satisfactory in the case of a river such as New River, because the model has to be extremely long, or if the model is made shorter it has to be excessively shallow.

Another method of studying such action is to construct what we call an integrating model which does not show curves and all details of the river and yet shows the fundamental hydraulic action in such a way as to satisfy mathematically the requirements. It might be called a simplified model of the river which is used for solving mathematical equations of flow in the river.

Q. Does that method combine the mathematical method and the model method?

A. Yes, sir; I should say so.

2373 Q. Have you read the testimony of the plaintiff's witnesses in this case in regard to the so-called power waves, such as Mr. Kramer and Col. Watkins?

A. Yes; I have read that testimony.

Q. On the subject of so-called power waves or tides, do you use the same terminology as that employed by the plaintiff's witnesses, or perhaps you might briefly define the terminology that you use, so that your testimony will be clear.

A. I think I am in substantial agreement with their terminology, but I also use other terms which they did not include, and I would like to have an opportunity to explain those terms at the present time by making a sketch, if I may.

Q. Will you proceed and briefly explain the terms you use in these hydraulic matters in regard to the so-called power waves or tides?

A. This curve would represent what I call a hydrograph of the power tide curve, in which vertical distances represent flows in cubic feet per second, and horizontal distances represent time. The discharges are measured above the line of zero flow, which I can mark zero.

By Mr. THOMPSON:

Q. Will you finish stating the terms that you wish to use that these other witnesses did not?

A. One term I used is called hydrograph, as it describes that type of curve.

By Mr. JACKSON:

Q. Go ahead.

A. The line connecting the lowest points of the two troughs of the tide I call the base flow line, B–B. I consider that a straight line, although my sketch shows it a curve.

By Mr. THOMPSON:

Q. Are you going to give the vertical there?

A. Yes sir. By amplitude of the tide I mean the length of the vertical line A—drawn from the crest of the curve to the base flow line. By volume of the tide, I mean the area of
2374 the curve above the base flow line, or the shaded area. By the average or mean flow line, I mean line drawn parallel to the base flow line, and I will letter the mean flow line M–M. It is drawn in such a way that the area between lines M–M and B–B, between the trough of the waves is equal to the volume of the tide above the base flow line. In other words, the mean flow line is drawn in such a way that the volume of the wave above the mean flow line would fill in the volumes of the troughs between the mean flow line and the base flow line.

Q. Is that on both sides or one side?

A. On both sides, the combined volume of both half troughs. I think that is all I need show on this sketch.

By Mr. THOMPSON:

Q. You have not given your vertical ordinate?

A. It is line A—which I call amplitude of the wave.

By Mr. JACKSON:

Q. I will ask the reporter to mark the sheet of paper upon which Prof. Thomas has drawn the sketch referred to in his testimony as Defendant's Exhibit 593.

(Said sketch, exhibit 593 offered in evidence.)

By Mr. THOMPSON:

Q. That mean flow line, is that the average flow line?

A. Yes, sir.

Q. Instead of the mean flow line?

A. I can use either the average flow line or the mean flow line interchangeably.

By Mr. JACKSON:

Q. You said there was some other term that you wanted to explain.

A. I also in my testimony would like to use the word "seiche" to describe fluctuations in reservoir or pools, or rather to describe the periodical fluctuations or oscillations in the surface of the reservoir or pool.

Q. What is the relation between the term "seiche," as you use it, and the term "oscillation" as was used by some of the Government Witnesses, if any?

A. I think it signifies the same thing, but the term "seiche," is a recognized technical term to describe oscillation in a large body of water.

2375 Q. Do you draw any distinction between variations in a power tide and an oscillation or seiche?

A. Yes, sir; in a seiche in a pool or reservoir, the ends of the pool or reservoir are raised alternately, in a manner 2376 which is analogous to the oscillations which occur in a plate of soup when it is tipped. That analogy is rather helpful in describing what is meant by seiche. Another term which I would like to use——

Q. (Interrupting.) May I ask you this: Will you state whether the variations in a power wave are above or below the average line or flow?

A. The variations of a power wave may be considered to be above or below the line of average flows. Those variations may be roughly one-half the amplitude of the waves.

By Mr. THOMPSON:

Q. Is that a universal rule?

A. I should say that is a simple definition of the use of the term.

Q. I mean does it have a general application?

A. Yes, sir. Another term which I should like to define is the volume of the crest of the wave.

By Mr. JACKSON:

Q. Will you proceed to define it?

A. The volume of that portion of the wave which lies above the mean flow or average flow line, is the volume of the crest of the wave. It is that portion which would have to be removed by a reservoir which would regulate the wave so as to dampen off the irregular flow in the river. The volume of the crest is normally equal to the volume of the two half troughs, which would correspond to the volume of the reservoir required to dampen out the waves.

Q. Can you on the sketch that has been marked Defendant's Exhibit 593, put a cross-hatching in some fashion on the particular part of the wave which you have described as the volume of crest and indicate what would have to be removed from the wave in order to regulate it or iron out the irregularities, and show where that would be put?

A. What I have defined as the crest of the wave, is the part which I am double hatching.

Q. Will you double hatch the part of the trough into which that volume of the crest would be put in case of reregulation?

(Witness does so.)

2377 Q. Now for the record, will you state whether or not the portions of the trough which you have cross hatched lie between the line M–B, and below the line M–M, and the outline of the base of the wave?

A. Those two cross-hatched areas which you have just described, represent the volume of reservoir required to completely take the crest off the waves and produce uniform flow in the river.

Q. What I wanted to know is, for the record, whether my description of those cross-hatch areas on Exhibit 593 was correct?

A. Yes, sir; that is correct.

Q. Was your purpose in drawing that sketch to make the volume of crest equal to the two cross-hatch one-half troughs below the line M–M?

A. Yes, sir; that is the principle used in drawing the mean flow line M–M.

Q. Will you state generally what is the relationship between the height of a power tide or wave and its length, that is, some general description, of what is the length and height of a power tide generally?

A. A power tide usually lasts for 24 hours, and in the New River their velocities are in the vicinity of three or four miles an hour: if the velocity was three, the tide would be 72 miles long, and the height of it might be a few feet or a few inches. The tides passing Kanawha Falls are usually a few inches in height and about 70 miles long.

By Mr. THOMPSON:

Q. Are you referring now to the Buck and Byllesby waves?

A. Yes, sir.

By Mr. JACKSON:

Q. Some time ago when I asked you about your observations on the Kanawha River, you stated you had observed the operations of the London and Marmet hydro station, of the Kanawha Valley Power Company. Will you please state in a little more detail what was involved in those observations?

2378 A. Those observations were made on August 14 and 15th of this year, and on those days the power plants at London and Marmet were operated under special conditions at my direction to produce a particular rate of increase and decrease of the flow of the river.

Q. At that time did you, in addition to observing the operation of the plant, make any study of the logs and charts?

A. Yes, sir; on those dates I visited the automatic gauges many times to study the fluctuations of the river level which were occurring at that time.

Q. Were these the tests that you were making?

A. Yes, sir.

Q. Describe the first tests that you made.

A. During the first test, the flow through the turbines of the London plant was regulated in loads so as to produce a power tide similar to tide No. 2 of the March 1930 series of tides, but with fifty percent greater amplitude. That test was of twenty-four hours duration.

Q. You say it was a fifty percent greater amplitude—is that amplitude in stage or in flow?

A. In flow.

Q. In second-feet?

A. The amplitude was approximately 4,100 second-feet.

Q. What was the relation between that and number two power tide in the 1930 series?

A. Number two tide in the 1930 series had an amplitude of just two-thirds of that.

Q. Proceed with the description of this test.

By Mr. GERDES. What was the volume of the 1930 wave?

2379 A. I don't have that computed except as to amplitude

By Mr. THOMPSON. You expressed the amplitude how?

A. In cubic feet per second.

Q. 4,100 cubic feet per second?

A. Yes, sir.

Q. That was in 1930?

A. No, sir; that was the actual test.

By the COURT:

Q. By that is it meant that that much water was released—4,100 second-feet, that the flow was increased that much?

A. Yes, sir; the water was partly released from the London pool or partly entered it at the upper end. They operated the plant so as to produce that flow in the pool according to that load throughout the twenty-four hours.

By Mr. JACKSON:

Q. This relationship to wave No. 2 of 1930, was that the wave in your test was 150 percent of that wave as produced at Kanawha Falls, or in that vicinity?

A. Yes, sir.

By Mr. THOMPSON:

Q. That 4,100 second-feet, was that the difference between what entered the pool and what went out of the pool?

A. No, sir; that was the amplitude of the wave. That was a wave having an amplitude of 4,100 second-feet, approximately.

By Mr. JACKSON:

Q. Tell us about the test, as to maintaining the pools.

A. It was operated in such a way as to maintain the pool between London and Marmet to satisfy Government regulations so as to allow for variations in the stage of that pool.

Q. What was the form of the outflow from Marmet?

A. The outflow from Marmet was very similar to outflow from London station. The pool between the two stations
2380 was maintained at as nearly a constant level as practicable.

Q. What was the relation between the outflow at Marmet station and No. 2 wave in the 1930 tests?

A. At the Marmet station, the water rose in the tail race during the test and then receded, giving a wave such as could be measured at Marmet.

Q. I am getting at this: What was the relation in volume between the wave or discharge at Marmet, and No. 2 wave of the 1930 tests, as it came down that part of the river?

A. It was fifty percent greater than the wave of the 1930 tests. The flow from Marmet was practically equal to the flow from London, because the pool was maintained at a practically constant elevation.

Q. What was the result of these tests at London and Marmet in respect to the navigation of the pools of the Kanawha?

A. I might say that our principal object in running the tests was to determine whether or not a wave could be employed to produce any seiches or periodic oscillations in the Marmet pool.

Q. And what did you find?

A. I found that there were no seiches in that pool which could be attributed to the waves that we ran. During the test there were minor seiches. The automatic gages—I might say
2381 that, during any period, the pencils of the automatic gages are continually moving indicating that minor fluctuations are constantly traveling up and down the surface of the navigation pools.

Q. What is the cause of these minor fluctuations?

A. The cause of these minor fluctuations are fourfold: they may be due to lock operation—the discharge of the water from the navigation locks; they may be due to changes in the discharge from the turbines of the power plant, as the turbines are started up or stopped, or as additional blocks of load are put on the turbines; they may be caused by the operation of the roller gates; and they may be caused by gusts of wind.

Q. When you refer to taking off blocks of load on units of a power plant, will you describe a little more fully what you mean by that?

A. These power plants are operated in such a way that it is not feasible or convenient to increase the load of the unit slowly or gradually, but, if it is desired to change the load, it is changed by steps. In other words, they refer to that as taking off or putting on a block of load.

Q. Are these blocks large or small, in comparison to the total load?

A. They are small as compared to the total load.

Q. When you refer to roller gates, are those the roller gates of the dam?

A. Yes, sir.

Q. Does the wind have any effect on minor oscillations?

A. Yes, sir; the wind has an effect on minor oscillations. I did not complete my answer to your question. You asked me a question about the effect of the tests and I started to describe and only completed part of the answer.

Q. Go forward, Professor Thomas, with your answer.

A. The tests showed numerous minor fluctuations, but
382 showed no large fluctuations which could be attributed to the main wave. There were absolutely no seiches of such nature that corresponded to the periods of the main wave, or that could be associated with the main wave, or main tide, in any way. In regard to the minor fluctuations, I personally was in the gage house at a time when a boat passed through the lock and I had a chance to see there that one of the oscillations of the gage was caused by the boat coming through the lock—the seiche of water from the lock just after the—before the boat came out of the lock. I also had a chance to witness the movement of the pencil after a load change was made in the turbine and saw that that particular oscillation was caused by the load change.

Q. Who operates the roller gates?

A. The Government.

Q. What was the total amplitude or vertical movement of these minor oscillations or fluctuations that you have mentioned?

A. Due to lockages, it was approximately 0.2 of a foot, in the test I witnessed, and in this test a seiche of 0.4 of a foot was caused by putting on a block of load at the London plant.

Q. Are any of these minor oscillations due to the power wave itself passing down the pool?

A. No, sir; they are absolutely not due to the power wave.

Q. What is the extent of the fluctuations that could be caused by roller gate operations?

A. It would be possible to cause a tremendous fluctuation by roller gates, if the roller gates were opened completely and simultaneously; they could cause a tremendous flood wave to travel down the pools.

Q. How would that compare with the potentialities of anything that could be produced by power stations?

A. Vastly greater than anything produced by power stations.

By the COURT:

You said that you noticed a minor fluctuation of 0.4 of a foot amplitude, resulting from putting on an extra load at the
2383 London plant?

A. Yes, sir.

Q. That would create a fluctuation in the pool where?

A. Just below London; it was measured just below the plant at London.

Q. In the Marmet pool?

A. Yes, sir.

Q. Is that a power wave?

A. No, sir; that is not a power wave, in the sense of using the term power tide. It was a local fluctuation.

Q. Due to the discharge of an increased amount of water through the machinery at London, wasn't it?

A. Yes, sir. But that is not what I call a power tide. Power tides rise gradually over a period of several hours, and recede about in twenty-four hours. This was an almost instantaneous discharge of the local plant.

By Mr. JACKSON:

Q. Do minor fluctuations occur from the operation of any plant a considerable distance upstream from a given point?

A. No, sir; they could not occur from such a cause.

Q. Does it represent what could occur in the tail race of a power plant?

A. Yes, sir.

Q. Did you, during this test, observe the amplitude of the wave at the foot of Marmet Dam below the Marmet Power Station?

A. Yes, sir; I observed that on the record of the automatic gage.

Q. What was it?

A. It was about 1.3-foot rise.

Q. And you said that this amplitude in volume was 4,100 second-feet?

A. Yes, sir.

Q. And that compared how with wave No. 2 of the 1930 series?

A. That was fifty percent greater than wave No. 2.

2384 Q. When I said 4,100 second-feet volume, it should have been amplitude in second-feet. When the discharge out of Marmet Power Station was cut off, was there any resulting oscillation in Marmet pool approximateing this amplitude of 1.3 feet?

A. No; indeed.

Q. What did occur in—

Q. (Continuing.) I mean the discharge from London Station into Marmet was cut off.

A. During that test, the discharge of London Station was cut off, gradually, and no oscillations occurred in the pool from that.

Q. Have you completed the description of the first test?

A. Yes, sir.

Q. Did you make any other tests?

A. Yes, sir.

Q. Describe that test.

A. That was a test in which the operation of the London plant was suddenly stopped; in which the flow at London plant was cut off almost instantly.

Q. What was the volume of flow involved when it was cut off—the rate of flow?

A. It was about 3,800 second-feet—was dropped instantly.

Q. Are you sure that it was 3,800 feet?

A. I will have to refer to my notes on that (witness refers to papers). I looked at the records on the gage later on. It was 3,200 second-feet.

Q. Will you describe more fully what was the object of this test—what were you trying to determine?

A. I wanted to determine for my own satisfaction whether or not the sudden dropping of considerable load at that plant would produce a surge in the Marmet pool; in other words, to be certain whether or not some of these oscillations I witnessed in the pool were actually due to their sudden load changes in the plant.

2385 Q. You said "surge"—that is the same as seiches, is it?

A. Yes, sir.

Q. What were the results?

A. This sudden dropping of the load produced a definite surge, with an amplitude of .3 of a foot.

Q. Where was that?

A. Just below the London plant.

Q. Could such a seiche arise from a wave emitted from Radford?

A. No, sir.

Q. Why not?

A. The reason is that a wave emitted from Radford, by the time it reached the Marmet pool, would have its form changed, so that its rise would be very slow, occupying a period of several hours, probably from four to five hours, and that rise would be altogether too slow to produce any seiche in the Marmet pool.

Q. Does what you have said about Marmet pool apply to the London pool?

A. Yes, sir; both pools.

Q. Do these tests that you have described represent the reasonable typical conditions of the operations at the Marmet and London hydro stations?

A. I would say, with reference to the second test, that would not represent the typical conditions, in that the rate of the stopping of the plant was at a much more rapid rate than would have been done typically.

Q. Professor Thomas, does the concurrent operation of the London and Mamet stations, under any circumstances, produce a result different than would be produced by the operation of one plant alone, on the Kanawha?

A. Yes, sir; it is possible for the plants to be operated in such, a way as to amplify the seiches.

Q. How would that happen?

2386 A. If the London plant were suddenly shut off, the water level below London would be lowered, and that would produce a negative wave which would travel down the river, and about an hour later would lower the water level at Marmet. If Marmet were suddenly started, with the load increased, it would lower the water level still more.

Q. The conditions have got to be concurrent?

A. Yes, sir; one superimposed on the other.

Q. Did you, in your test and study of the record, observe such a condition?

A. I observed conditions where I thought there was amplification of the waves, but I would not state that I could prove such amplification, because the time records of the automatic gages are not accurate enough to definitely prove that one surge amplifies another, but I consider that certain surges were caused by amplification.

Q. You took a time record, you say—do you refer to the clocks?

A. Yes, sir.

Q. I show you a copy of Government's Exhibit No. 229, which I would like for you to look at. (Hands paper to witness.) Now,

you observe there a fluctuation on June 16th, 1936, according to that exhibit, do you?

A. Yes, sir.

Q. And have you any opinion as to the cause of that fluctuation?

A. My opinion is that that fluctuation was caused by the variations in the load at London and Marmet plants,—rather sudden variations.

Q. Have you any opinion as to whether or not this was caused by the simultaneous, or as the result of the concurrent operation of the two plants?

A. My opinion is very strongly that such is the case, but I have studied the records very carefully and I cannot prove it on account of the uncertainty of the time recordings of the
2387 automatic gages.

Q. State from the exhibit the time when that seiche occurred and its extent.

A. It occurred at four o'clock P. M. on June 16th.

Q. May I substitute this so I can hand a copy to the Court, so that your testimony may be followed.

A. (Continuing.) It had a maximum amplitude of about .7 of a foot.

Q. Does that chart, Government's Exhibit 229, show any secondary oscillations?

A. Yes, sir, there is a secondary oscillation at the upper end of Marmet pool, in the latter part of the morning, about ten o'clock, showing a——

Q. (Interrupting.) What date was it?

A. (Continuing.) showing a surge resulting in a vertical line on top of the main wave.

Q. When was that?

A. June 16th.

Q. You refer to a perpendicular line at the top with this notation "591.0," 11,000 C. F. S."

A. Yes, sir.

Q. Have you any opinion as to the cause of that?

A. My opinion is that it was caused by the operation of the lock. That oscillation is exactly of the character and amplitude of the other oscillations that were observed from lockages.

Q. Did you examine the lock records?

A. I examined the lock records and there was a record of lockage at London at that time.

Q. Referring to the notation "591.0" and 11,000 second feet, state whether or not in your opinion the discharge at that
2388 time actually was 11,000 second feet?

A. No, sir; I think it is very improbable that it was 11,000 second feet.

Q. And going back to the line you said you thought was caused by lockage, is that what you call a seiche or not—that short vertical line?

A. It is the beginning of a seiche. It runs into or is obscured by the main wave and is not evident on this chart.

Q. Does this phenomenon indicated by the legend 591.0—11,000 second feet, represent a seiche or not?

A. I should say there was a seiche in the pool at that time and, therefore, the ordinary relation between a stage of water and discharge in second feet does not hold at all. The ordinary relation would not hold. At the bottom of the seiche is marked zero cubic feet a second, but the flow was not zero cubic feet a second. Both power plants were in operation at the time, so these figures of 11,000 second feet and zero feet have no meaning. They were clearly not the true discharges at that time.

Q. Are you familiar with what has been referred to in this case as the 1930 wave tests?

A. Yes, sir.

Q. Will you state to what extent, if at all, you have taken this tests into consideration in your study?

A. I have studied these tests very carefully, making a close study of the decrease in amplitude of the various waves as they travelled down the river, passing various gaging stations.

Q. I show you a chart marked Government's Exhibit 227, and ask you whether or not you examined that chart in connection with your studies?

A. Yes, sir; I examined that chart.

2389 Q. What importance, if any, did this power wave test of 1930 have on your studies of the possible effect of the Radford power station.

A. These waves are of great importance in such a study, because they make it possible for one to check his results with his computations or decisions and determine the action of possible waves from future construction on the river. This series shows waves of different amplitude and different volumes, and waves occurring at different stages of the river, and the whole series is just a gold mine of information on the behavior of waves on this river.

Q. What, if any, conclusions did you draw from the wave tests of 1930?

A. One can draw the general conclusion that, as waves travelled down the river, they decreased in volume and amplitude.

Q. Substantially or otherwise?

A. Substantially.

Q. Do they in any instance disclose an increase at a particular point as they travel downstream?

A. In rare instances there is a slight increase in amplitude, occurring about where a wave of approximately rectangular form is changing from that form to triangle form; just after it is introduced in the channel, it may show an increase in amplitude or is likely to show it.

Q. What, if any, significance does that phenomenon have in the consideration of the effect of any such waves in the Kanawha River?

A. Little or no significance in that connection.

Q. Is there such a thing as the characteristic shape of a wave on New River?

A. I should say there is a characteristic shape of waves on all steep rivers, and these waves on New River have that characteristic shape.

2390 Q. How would you describe that shape?

A. The shape of the wave is plotted on the hydrograph and it is triangular with the downstream slope somewhat steeper than the upstream slope, the crest slightly rounded.

Q. Well, now, you say that the front of the wave is steeper than the back. Can you give some indication of the order of that slope in front of the wave?

A. Yes, sir; I could take, for example: No. 2 at Kanawha Falls which has an amplitude of stage in the neighborhood of six or seven inches, as near as I can read on the chart, say seven inches. For its total length we have a wave of twenty-four hours duration and moving three miles an hour, which would be seventy-two miles long. According to the chart, the period of rise is about, as near as I can read the scale, is four or five hours, say about four hours, and at three miles per hour, that would be twelve miles long for the wave front and a height of about seven inches.

By Mr. THOMPSON:

Q. That is No. 2.

A. Yes, sir.

By Mr. JACKSON:

Q. A slope of how much?

A. Seven inches in 12 miles, approximately. I am reading just without scaling it precisely. The rear of the wave would have a fall of about 7 inches in 20 hours and three times twenty would be 60 miles, giving a slope of seven inches in 60 miles, for the rear or descending part of the wave or tide.

Q. State whether or not it is the characteristic of the power tides on New River that they retain their amplitude and volume in passing down the river?

A. No; the characteristic is just the opposite. They lose their amplitude and volume in passing down.

Q. What is the relation between succeeding waves—do they tend to catch up with one another as they go down stream?

2391 A. The front of each wave tends to overlap the tail of the preceding wave. The individual wave being sent down the river would develop a tail in a duration of more than one day—perhaps two or three days—and each subsequent wave arrives on the tail of the preceding wave, so that the amplitude of the crest is not the same as the amplitude of the original wave—it is much less.

Q. Does that mean that the decrease is greater with a periodic power tide of twenty-four hours duration or not?

A. Periodic waves would have much less amplitude as they reached the Kanawha River than an individual wave would have.

Q. What do these 1930 power tests show with reference to the decrease or persistence of power tides in amplitude and volume?

A. They show in general that the tides decrease in both amplitude and volume as they travel down the river, with one minor exception that I mentioned.

Q. Have you made any study of the form or forms of power tides which might be released from the Radford power station?

A. Yes, sir, I made studies of such tides.

Q. What were the forms of those tides?

A. One tide I studied had a rectangular hydrograph having an amplitude of 9,000 second feet and a duration of eight hours.

Q. What does that mean with reference to the initiation of the flow and the cessations of the flow?

A. It assumes the flow to start instantly and continue eight hours for 9,000 feet a second and a cessation instantly.

Q. I show you Government exhibit No. 132, and direct your attention to the green square in the lower figures on the chart, and ask you whether or not, as to shape, that is the kind of wave about which you have just been testifying?

A. Yes, sir; that is the shape.

2392 Q. And this was peaking how many second feet.

A. Nine thousand for 8 hours. This [indicating Pl. Exhibit No. 132] is nine for 6⅓ hours. 2,000 second feet was an error; because that was not enough water to peak 6⅓ hours but only 5⅓ hours.

Q. Professor Thomas, in the light of your experience and knowledge of water power engineering, is it reasonably conceivable that waves—that a wave of that rectangular form, would ever be emitted from the Radford hydro station?

A. No, sir; I think it is highly improbable that a wave of that form would be emitted from the Radford station.

Q. What is the significance of the consideration of a wave of that form. Is it practical or theoretical?

A. It seems to me theoretical.

Q. I now produce a chart bearing the label Appalachian Electric Power Company—Estimated Discharge from Radford power station, and ask that it be marked Defendant's Exhibit No. 594 for Identification.

(Said paper was so marked as indicated.)

Q. I show you, Professor Thomas, Defendant's Exhibit marked for Identification No. 594, and ask you to examine it and state what it is?

A. This is a hydrograph given me by the Appalachian Electric Power Company, as representing a possible hydrograph of operation from the plant during rather severe peaking operation. It shows the discharge from the plant in cubic feet per second at various hours of the day.

Q. In your opinion, is the form of weekday operation shown on Exhibit 594, for identification a reasonable form of peak weekday operation for the Radford plant?

By Mr. THOMPSON. We object to that. It is not in evidence yet.

By the COURT. Read the question. [The question is read.]

By Mr. THOMPSON. The document is not in evidence yet. It has simply been marked for identification.

By Mr. JACKSON. I asked if it was a reasonable form before I offered it.

By the COURT. He wants the witness to say whether it is a reasonable form, before putting it in evidence.

By Mr. JACKSON. We are dealing with a plant not yet in existence, and I want the witness to consider certain hydraulic effects of certain operations, and I am asking him whether or not this possible method of operation would be a reasonable one.

By Mr. THOMPSON. Mr. Jackson consistently objected over and over again to any testimony going in with reference to our exhibits which were being offered in evidence, until they were offered in evidence. Here is a question being put to the witness as to whether or not this program is reasonable.

By the COURT. He is familiar with the plans of the plant, I suppose, its capacity, etc.

By Mr. THOMPSON. I don't know whether he is or not. He has not testified to that.

By the COURT. He may answer it.

The complainant excepts to the ruling of the Court, for reason stated.

By Mr. JACKSON. Read the question. [The question is read.]

By Mr. THOMPSON. He has not qualified him on that subject. His qualifications have gone, as far as I can observe from the rapid fire of questions, to the fact that he advised the City of Pittsburgh, and other cities, in respect to walls they would build along the river banks to protect them from floods.

By the COURT. I think he is qualified. If for no other reason than that he was employed by the Government in consultation as to hydroelectric matters at Bluestone dam; that indicates that he is qualified.

By Mr. THOMPSON. No foundation has been laid for his knowledge of the Radford project or how they will operate it or anything of that sort.

By Mr. JACKSON. They can only assume the methods of operation. It is not in operation and not built.

By Mr. THOMPSON. Further, this Radford project is part of the system of the Appalachian Electric Power Company.

2393 By the COURT:

Q. Mr. Thomas, do you know, generally or specifically the plans for this Radford project?

A. Yes, sir.

Q. The height of the dam?

A. Yes, sir; generally.

Q. What is to be installed as to the hydro-electric capacity?

A. Yes, sir.

By Mr. JACKSON:

Q. In your opinion, is the form of weekday operation shown on Exhibit 594, for identification, a reasonable form of peak weekday operation for the Radford plant?

A. Yes, sir, in my opinion this is a reasonable form of operation for that plant.

Q. In your opinion, what other forms or methods of operation—or rather would other forms or methods of operation for that plant be reasonably possible?

A. Yes, sir.

(Exhibit 594 offered in evidence.)

By Mr. JACKSON:

Q. Professor Thomas, how many years have you taught water power engineering?

A. Since about 1912.

Q. And you have taught at the Rose Polytechnic Institute and the Carnegie Institute of Technology since that time?

A. Yes.

Q. And have you seen the system load curve of the Appalachian Electric Power Company, introduced by the Government as "Government Exhibit 142," to which I direct your attention?

A. Yes.

Q. Have you examined other load curves of the Appalachian Electric Power Company?

A. Yes.

2394 Q. In your opinion, would the operation of the Radford plant, in accordance with the method shown on defendant's Exhibit No. 594, be a reasonable or an unreasonable method of operation?

A. I consider it to be a reasonable method of operation.

The COURT. Let me get something straight: What is meant by the 3000 second foot days?

By Mr. JACKSON:

I will ask the witness to explain that.

A. It would be 3,000 cubic feet times 86,400 seconds in a day. 3000 second feet would be flowing for one day—that volume of water. It represents the total volume of water of the wave or tide, so to speak, measured in second foot days instead of in cubic feet. You will obtain the cubic feet by multiplying the number of second-feet-days by the number of seconds in a day.

By the COURT. Q. Does that mean, for example, that this wave represents the release of the same amount of water, although it is distributed, as would be released at a constant flow of 3000 feet a day?

Mr. JACKSON. It means a peaking of that draft of 3000 second feet a day, resulting in these various flows at various times.

By Mr. JACKSON:

Q. You stated that you had studied two forms of discharge of the Radford power station; am I right in understanding that the first one is a rectangular wave, such as is shown at the bottom of Government Exhibit No. 132, with an amplitude of 9000 second-feet in a duration of eight hours?

A. Yes, sir.

Q. The other wave is one with the characteristics shown on Exhibit 594?

A. Yes.

Q. And do those waves each deal with the same volume of water daily, or not?

A. Yes, for the same amount—3000 second-feet days.

2395 Q. Is the Ivanhoe Gaging Station near the Radford dam site?

A. Not very near.

Q. Is it above or below?

A. Above it.

Q. What were the volumes of the larger power tides of the 1930 series of wave tides in the form in which they pass the Ivanhoe Gaging Station?

A. The first is about 2,700 second-feet days and they vary from that down to 2,000.

Q. Those waves represent the peaking in the particular form of either 2,000 second-feet days or 2,700 second-feet days?

2396 A. Yes.

Q. Coming back to these two hypothetical waves which you have studied, the one the rectangular form and the other the form shown in Exhibit 594, did you reach any conclusion as to the amplitude of these hypothetical power tides if released from the proposed Radford power station, upon their reaching the Kanawha River?

A. Yes.

Q. Upon what do you base your judgment in that respect?

A. My judgment is based on studies of the 1930 series of power tides in the river, taking into consideration the rates of reduction of the amplitudes, and it is also based on the result of experiments I made on an integrating model, showing that portion of the New and Kanawha Rivers.

Q. Did you give any consideration to the mathematical relationship involved?

A. I made certain computations along those lines, although not a complete mathematical analysis of the progress of the wave.

Q. Have you stated the basis on which you reached your conclusion?

A. Yes.

By Mr. THOMPSON:

Q. Will you state it again?

A. Integrating model tests and a study of the 1930 series, and also certain computations.

By Mr. JACKSON:

Q. Professor Thomas, in your opinion, what would be the amplitude of a power tide emitted from the Radford station in the form and volume shown on Exhibit 594, when it reached Kanawha Falls?

A. In my opinion, the amplitude of such a tide would be approximately 3,500 second-feet.

Q. And that would be a reduction from the maximum of what at the point of discharge?

2397 A. 9,000 second feet.

Q. And, in you ropinion, what would be the amplitude of the rectangular wave with 9,000 second feet amplitude in eight

hours, as emitted from the Radford Station, when it reached Kanawha Falls?

A. About 4,000 second feet.

Q. And that would be a reduction from what maximum amplitude in second feet at the Radford station?

A. From 9,000.

Q. What would be the maximum of the amplitude of those two waves—the theoretical 9,000 second feet rectangular wave and the one corresponding to Exhibit 594, expressed in terms of variation upwards and downwards, from the equivalent natural flow at Kanawha Falls?

A. This variation would be approximately half the amplitude I gave before. In other words, approximately 1,750 cubic feet per second for the wave shown on this exhibit, and approximately 2,000 above and below the mean in the case of the rectangular wave.

Q. Is it my understanding that that means, in the case of the wave represented by Exhibit 594, there would be at Kanawha Falls a maximum variation of 1,750 second feet below what would otherwise be the natural flow?

A. Yes.

Q. And the same amount above?

A. Yes, sir.

Q. And the situation would be the same for the rectangular wave except the variation would be 2,000 second feet?

A. Yes.

Q. Are these results which you have just given applicable to isolated power tides, or to periodic power tides?

A. They are applicable to periodic power tides occurring for a succession of days.

2398 Q. How long would these figures apply if you had a power tide of the same kind you have described following each day?

A. They would be indefinite, each following the other as long as the series lasted.

Q. Assuming that the power stations were entirely out of operation on a Sunday, would the results be true of power tides at Kanawha Falls caused by power station discharges of the two given forms on the succeeding Monday?

A. Yes, the amplitude would be about the same on Monday as on other days.

Q. And assuming that the power station had been shut down for a period of a day and a half at the week end, would the figures that you have given be applicable to the emission of power waves at the two times you have described on the following Monday?

A. Yes, those figures would apply to them.

Q. Assume that the power plant were to be shut down for a period of two days, would the conclusions that you have stated be applicable to waves of the form and amplitude that you have described, if they were emitted from the plant on the following Monday?

A. Yes.

Q. Have you any opinion as to what would be the maximum rate of increase in flow of these two forms of power tide, the rectangular tide and the one corresponding to exhibit 594, at the time they were passing Kanawha Falls—the rate of increase in flow? I want to know what would be the maximum rate of increase in flow when power tides of the two kinds you have described having been emitted at the Radford dam site came down the stream and were passing the Kanawha Falls?

A. For the rectangular tide, the maximum rate of increase at Kanawha Falls would be about 1,200 second feet per hour,
2399 while for the tide corresponding to the exhibit 594, the maximum rate of increase at Kanawha Falls would be about 800 second feet per hour.

By the COURT. Q. What is the difference between this question and the answer and the question you asked a minute ago, where you said the answer would be the wave would increase 4000 feet?

Mr. JACKSON. 3500. The difference is this: The answer to the succeeding question shows a wave that had an amplitude at the time of discharge in the rectangular form of 9,000 would have decreased to 4,000 when it got to Kanawha Falls, and if it were in the form of 594, it would have decreased to 3,500. I am seeking to draw from the witness the question of rate of increase in flow. That is, if one of these waves comes down, it increases the flow, and I am now seeking to draw from the witness the rate in which that increase takes place. For instance, if it was a wall of water, it would have an instantaneous increase of, say 4,000 second feet, and, on the other hand, if it was a gradual flow, the increase would be only so much. In other words, it would be a gradual rise at Kanawha Falls.

The COURT. The crest of that wave would be—do I understand the crest of the wave would be carrying an increase at the rate of 4,000 feet?

Mr. JACKSON. Eventually a point would be reached on that wave, if it was a rectangular wave, when there would be an increase at Kanawha Falls of 4,000 second feet, but that point would not be something which happened as an immediate change. It would be a gradual change in condition, and the point of this question is to bring out from the witness how gradual it would

be. That is, if it was a wall of water, it would have one effect, and if it was a gradual increase it would have no effect. I might ask the witness to illustrate it, as I should have done before, as he could do it much better.

By Mr. JACKSON:

Q. Can you illustrate that a little more clearly than I can explain it to the Judge?

A. Yes. (Witness makes diagram.) If this diagram would represent the hydrograph of one of these waves at Kanawha Falls, say the wave caused by a wave at Radford similar to Exhibit 594, the figure of 3500 second feet which I gave as the maximum amplitude of that wave at Kanawha Falls, would be the height of the wave, and the figure which I gave for the rate of rise would be the increase of rise in one hour. If a vertical line is drawn from the curve intercepting a horizontal distance of one hour, the rate of rise per hour which I gave as 800 second feet would be represented by this line. One is the total amplitude of the wave, and the other the steepness of its front, as measured by the rate of rise per hour.

2400

By Mr. THOMPSON:

Q. What is the distance across there?

A. 24 hours.

By Mr. JACKSON:

Q. Will you mark that for the two figures?

A. Yes. (Witness marks on plat.)

By the COURT:

Q. That is 800 feet?

A. That is the rise of one hour.

Q. Then it would be some time in the progress of that wave before the rate of flow would have been increased by as much as 3500 feet over what it was before the wave reached there?

A. Yes.

By Mr. JACKSON:

Q. And would the rate of that increase depend upon the slope of the front of the wave and the rate of travel?

A. Yes, it would depend on those two things.

Q. And this kind of wave, roughly, what would be the length of the slope in the front of the wave.

A. Assuming that the velocity of travel of the wave is three miles an hour, and the duration of the rise from here to here [indicating] is about four hours, the length of the front of the wave would be three times four, or twelve miles.

Q. It would be about twelve miles?

A. Yes.

By Mr. THOMPSON:

Q. That is the crest of the wave?

A. The length of the front of the wave.

By Mr. JACKSON:

Q. That wave, if it is 3,500, it would be a little more than four hours?

2401 A. Yes. I used as an illustration four hours. The actual rise is more than four hours.

Q. You said the base of the front of the wave would be around twelve miles or better in length?

A. Yes.

Q. Do you know what is the vertical height of that front of the wave?

A. I do not have that figure exactly in my mind, but it is in the way of seven or eight inches at Kanawha Falls. That is just approximately.

Q. So the slope of the front of the wave, as it moved down the stream at Kanawha Falls, would be in the way of base of twelve miles and a vertical height of seven or eight inches?

A. Yes.

By the COURT:

Q. Do your figures and statements there—could they in any way be modified by the stage of the water in the stream below the point of release?

A. No, the waves seem to have about the same amplitude at different stages. There is not much variation in the amplitude with the stage.

By Mr. JACKSON:

Q. Mr. Thomas, will you mark on your diagram there, so as to indicate the length of that wave in miles, on an average, and in hours at the bottom of the wave?

A. (Witness marks on chart.) I might say I used the figure three miles an hour velocity as a representative figure. I did not happen to have the exact figure at this time, but it is between three and four.

Q. It would be somewhere around 72 miles or better?

2402 A. Yes. I do not like to mark this on this diagram, as this is a diagram of time. If I mark miles on it, it would not be correct. I can say corresponding to 72 miles on the profile. The correct time on the other would be comparative.

Mr. JACKSON. Mr. Reporter, will you mark the chart on which Mr. Thomas has drawn as "Defendant's Exhibit No. 595."

NOTE.—The chart is marked accordingly.

Q. Now, Professor Thomas, assuming a discharge at Radford of waves of the forms you have considered, that is the rectangular wave of 9,000 second feet amplitude, and eight hours duration, and the wave corresponding to Exhibit #594, please state what would be the maximum rate of decrease in the discharge or flow as these two power waves or tides, respectively, passed Kanawha Falls?

A. For a wave corresponding to Exhibit #594, the maximum rate of decrease would be about 250 second feet per hour. The figure here is not to scale [referring to drawing] and on this sketch this is not short enough compared to the 800 but the maximum rate of decrease would be 250 second feet per hour.

Q. What would be the maximum rate of decrease per hour at Kanawha Falls in the case of a rectangular wave of 9,000 second feet amplitude of eight hours duration, at the Radford dam site?

A. About 300 second feet per hour.

Q. Why does the rate of decrease per hour in the case of each of these two waves on passing Kanawha Falls differ from the rate of increase per hour at the same point for the same waves as they approach and pass Kanawha Falls?

A. Because the front or downstream face of the wave is steeper than the tail or up-stream face of the wave.

Q. Do you know how those rates of increase and decrease in flow at Kanawha Falls, resulting from the passage of the two forms of power waves from Radford which you have just described, compare with the actual rates of increase and decrease in flow out of the London and Marmet power stations?

A. These rates are very much smaller than the present
2403 rates of increase and decrease out of the London and Marmet stations. At those stations the maximum rates which are ordinarily used are in the neighborhood of 3,000 second feet per hour, and several times greater than the rates I have mentioned.

Q. That is the rates in increase and decrease in flow at those points?

A. Yes, sir.

Q. From the standpoint of the possibility of producing seiches and oscillations in the pools, what is the more important, increase or decrease in flow?

A. Decrease. These seiches are ordinarily caused by decrease. In my test I made on that matter of decrease the decrease of 3,200 second-feet per hour produced a seiche of $\frac{3}{10}$ of a foot. That was at London. The height of the seiche was $\frac{3}{10}$ of a foot. The decrease which produced that seiche was more than twelve times this rate of decrease of 250 second-feet per hour.

By Mr. THOMPSON:

Was that the upper or lower London——

By the WITNESS:

Lower.

Q. Did you state the ratio between the rate of decrease of this experiment at London and the rate of decrease for your wave?

A. Yes; I stated that.

Q. That applied to Exhibit #594?

A. Yes, sir.

Q. Can you tell me what was the ratio between the rate of decrease in this test at the London dam and the rate of decrease which you found for a rectangular wave discharged at Radford by the time it had reached Kanawha Falls?

A. The rate of decrease for the rectangular wave by the time it had reached Kanawha Falls was 300, which was less than $\frac{1}{10}$ of that observed during the test at London.

Q. In your opinion would it be possible for power tides from the Radford power station of the two forms and sizes which you have described to cause seiches or oscillations in the Kanawha navigation dam pools?

2404 A. No. In my opinion it would be impossible for waves released from a point as far upstream as Radford to cause any perceptible seiche in those navigation pools.

Q. Could the instantaneous shutting off of the flow of 9,000 second feet out of the Radford power station cause any seiche or oscillation of the London or other Kanawha River navigation pools, sufficient to cause any perceptible drop below the normal pool level?

A. No, it could not. Although the wave might be shut off instantly at Radford, this is, the tail of the wave would be vertical at Radford, by the time it had traveled downstream its tail would have flattened out, so the decrease would take many hours; therefore, the instantaneous shutting off at Radford would have no effect at all in producing a seiche.

Q. What is the period, natural period, of oscillation of the London pool at elevation 614 or 611?

A. It is approximately 1.2 hours.

Q. And what is the natural period of oscillation of the Marmet pool?

A. Approximately 1.8 hours.

Q. Will you explain what is meant by that?

A. If one of these seiches occurs which has been likened to the tilting of liquid in a plate of soup, the period of oscillation is the time from the rise at any one time to the subsequent rise at that same point. If a seiche occurs in the Marmet pool, the water at

one end of the pool will gradually rise and fall, that is, from the high point and low point back again is the period of oscillation.

Q. If a seiche occurred at the upper end of the Marmet pool would the period of oscillation have any relation to the time it would take for that seiche to travel down to the dam and back to the upper end of the pool again?

A. Yes. The period of oscillation is equal to the time it would take a wave to travel the length of the normal pool and back.

Q. What, if any, relationship is there between the natural periods of oscillation on the London and Marmet pools, and the possibility of a possible power wave, such as you have described, the two kinds you have been considering, being discharged at Radford causing any oscillation in the London or Marmet pools?

2405

A. In order to cause oscillation in a body of liquid, you have to have an impulse of shorter duration than the period of oscillation. In tilting a plate of soup, to start this oscillation, you have to tilt it quickly If slowly, you cause no oscillation in the surface. These tides from Radford will occupy several hours to rise and fall, those periods being much longer than the oscillation at those pools; therefore, they would cause no seiches in those navigation pools.

Q. Can you state what would be the period of time required for one of those Radford power tides to rise at the London and Marmet pools, and the period of time required for the fall of those waves at the London and Marmet pools?

A. The time of rise is approximately five hours, four and a half to five hours; and the time of fall is the difference between that and twenty-four, or in the neighborhood of nineteen hours.

Q. In your opinion, is there any possibility that power tides from the Radford station could cause the London pool or any other Kanawha navigation pool to have its water surface tilted in such way as to cause the upstream end to be lower in elevation than the downstream end?

A. No. In my opinion it would be impossible to tilt the water in those pools that way.

Q. Professor Thomas, assuming the discharge of a wave at the Radford power station with the same form as that shown on Exhibit #594, but with a smaller maximum amplitude, would the effects produced by the resulting power tides at Kanawha Falls be greater or less than those you have described in connection with the wave corresponding to Exhibit #594?

A. They would be no greater, and probably less.

Q. Professor Thomas, assuming a wave of the same form as that shown upon Exhibit #594, and particularly the same duration, but with a lesser maximum amplitude, and using a lesser total volume

of water, would that wave, in your opinion cause seiches or oscillations in the navigation pools on the Kanawha?

A. No.

2406 Q. Now, Professor Thomas, assuming a form of operation which would result in a peak load output of 3,000 second foot days, or in other words, using 3,000 second feet days for peaking purposes, but with a greater duration of peak load than shown on Exhibit #594, what would be the effect of the resulting power tide having been emitted at Radford when it reached Kanawha Falls, as compared with the effects of the tides from the two forms of waves you have already testified about in detail?

A. Under conditions as set out in your question, the amplitude of a wave at Kanawha Falls would not be greater and would probably be less than of that which I previously described.

Q. And what would be the situation as to the possibility of seiche or oscillation in the navigation polls?

A. Such waves could cause absolutely no seiche or oscillation in the navigation pools.

Q. I want to invite your attention again a moment to a hypothetical rectangular form of wave which you considered, that is, the hypothesis of the discharge of a perfectly rectangular wave at Radford, with an amplitude of 9000 second feet, and a duration of eight hours, what is your opinion as to whether any conceivable operation of the Radford station could at Kanawha Falls produce tides with amplitudes greater than would be produced by a discharge from the Radford station in this particular rectangular or block form about which you have testified?

A. No conceivable method of operation could produce, with that same volume of water, a greater tide at Kanawha Falls.

Q. Would that be true of any other volume of water, assuming the same height?

A. The maximum amplitude is 9,000 second feet.

Q. What I wanted to find out is, a maximum amplitude of 9,000 second feet, and a perfectly rectangular form of wave, would the extension of the duration of the wave to more than eight hours, change the effect down at Kanawha Falls?

A. No, it would not make the amplitude of the wave at Kanawha Falls any greater.

Q. And suppose you went far enough and kept extending
2407 the duration of that rectangular wave with an amplitude of 9000 second feet, what would happen?

A. If you extended it the full twenty-four hours it would be a uniform flow and no waves would occur at Kanawha Falls.

Q. Would the result of that be that the amplitude of fluctuations at Kanawha Falls would grow less from some point of duration, around eight hours—between that and twenty-four?

A. Yes, sir.

Q. You have testified you are consulting engineer on hydraulic design at the Bluestone Reservoir, I believe?

A. Yes, sir.

Q. Have you studied the effect of power tides from the Radford station upon the pool of the Bluestone reservoir project as it is described in Government Exhibit #145, the 308 report on the Bluestone?

A. Yes, I have made a study in connection with this case, and not in connection with my work on the Bluestone dam.

Q. Have you considered in particular the effect of power tides of the form and character about which you have been testifying this afternoon in that connection?

A. Yes, sir.

Q. Where is the head of the proposed power pool for the Bluestone project?

A. In the vicinity of Glen Lyn.

Q. In your opinion, would the Radford power tides of the two forms about which you have been testifying this afternoon be capable of causing seiches or oscillations with amplitudes of five feet upward and downward in the Bluestone reservoir at and downstream from Glen Lyn?

A. No. In my opinion neither of these waves which I studied would produce any perceptible oscillation at all in the surface of the Bluestone reservoir, not as much as one-half inch or one inch.

2408 Q. Will you state somewhat more fully the reason for your opinion in this respect?

A. I have studied that by analytical methods and also by constructing what I call an integrating model of the Bluestone reservoir, with different vertical and longitudinal scales, and it was sensitive enough to detect seiches of above five one hundredths of a foot, or 5/8 of an inch.

(A. (Continuing.) I could not detect any perceptible seiche in the reservoir on this model, which checked my computation, which showed the height of seiche in the Bluestone reservoir would be less than five one hundredths of a foot.

Q. You say 5/8 of an inch. Do you refer to the model or reservoir?

A. In the actual reservoir.

By the COURT:

Q. What pool elevation did you have in mind when you answered a question a little while ago, at the Bluestone?

A. That was spillway elevation, 1490.

2409 By Mr. JACKSON:

Q. What is the natural period of oscillation of the Bluestone reservoir when it as at pool elevation, 1,490?

A. It is about wo hours.

Q. Now does that effect have anything to do with the possibility of the production of a seiche from the inflow of a power tide admitted at Radford?

A. Yes, sir.

Q. What has it go to do with it?

A. The period of rise of a power tide would have to be less than that f it produced a seiche.

Q. Would it be?

A. No; it would not be.

Q. Roughly, what would it be?

A. I would have to look up my notes to answer that question. (Witness does so.) About four hours.

Q. Prof. Thomas, assuming the Bluestone reservoir was in existence, what, if any, effect would the Bluestone reservoir have upon dampening out the Radford Power Tide?

A. If the Bluestone reservoir were in existence, I presume there would be a power station there and there would be an operator there and he would also operate the gates on the Bluestone dam. Under those conditions it would be absolutely in the power of the operator to control the Radford tide in any way desired. He could store up those tides and release them in whatever manner best suited to the generation of power at Bluestone. Of course, it would ordinarily be worth while to do that, and not let any of the Radford tide spill over the spillway, and to utilize every bit of power for power generation at Bluestone and under that condition the tide could not pass through the Bluestone reservoir at all. On very rare occasions it might be possible for the flow of the river to be slightly in excess of the capacity of the Bluestone Power plant, so that the water would be spilling over the spillway of the Bluestone reservoir, and at the same time there would be a remote possibility that the Radford station might be operating on peak load. It would be unlikely with so much water in the river as that, but it would be a possibility. Under those
2410 conditions it is conceivable that the Radford tide could pass the Bluestone Reservoir but in enormously dampened out form.

Q. In your opinion would it be probable there would be peaking at Radford when there was a flow over the spillway at the Bluestone Reservoir?

A. In my opinion there is a very improbable combination.

Q. Is there any other combination that you know of under which, with the Bluestone Reservoir in existence and in operation that the Radford power tide could pass the Bluestone Reservoir?

A. No; I cannot think of any other possible condition.

Q. Under the condition you have assumed, with a pool level at elevation 1,490 feet, and water spilling over the spillway, how large would the flow have to be at a minimum, that is, what is the hydraulic capacity of the Bluestone Power station?

A. I don't have that in mind now but I think it is 11,000 second-feet. I am not positive about that figure.

Q. Assuming the hydraulic capacity of the Bluestone to be 11,000 second-feet, would the flow have to be in excess of that to result in this coincidence you have described?

A. Yes; it would have to be in excess of that.

Q. By the COURT. I want to know why it would be improbable that the Radford dam would be peaking when the river was full?

By Mr. JACKSON:

Will you answer the Court's question. State why you deem it improbable that the Radford plant would be peaking when the flow at Bluestone would be 11,000 second-feet?

A. With so much water running, they could run the Radford plant day and night for the purpose of saving coal in their system, it would not be necessary to run it at peak, but under those circumstances they could run it continuously.

Q. Do you mean there would be enough water available to run that Radford plant at its maximum for 24 hours?

A. At a uniform high rate for 24 hours, and they need not attempt to save it up at night and release it during the day 2411 but they could just run it continuously so as to save coal on the whole system.

By the COURT:

Q. At what hydraulic capacity would they be running at Radford?

A. They could run their full capacity, 9,000 second-feet, day and night.

Q. That is the capacity they have been speaking here as being the peak?

A. There would be enough water so that they could keep on going day and night and they wouldn't have to shut down, they could simply run continuously. The purpose of peaking when

there is not much water running in the river, is to save it up at night and utilize it in the daytime, but when there is plenty of water in the river they don't have to do that, they just run continuously, generating as much power as they want to, and shut down their steam plant.

Q. If, when the flow into the Bluestone reservoir exceeded 11,000 second-feet, the Radford reservoir was partly empty, would the Radford operation necessarily be uniform?

A. My opinion is that under those conditions with the reservoir partly empty there will be no peaking and the flow will be uniform.

Q. I meant to assume in that question that the Bluestone reservoir was full?

A. Yes.

Q. In your opinion what would be the likelihood of the Radford reservoir being partly empty when the Bluestone reservoir was full and the flow was in excess of 11,000 second-feet at Bluestone?

A. I think it would be improbable that the Radford reservoir would be partly empty under those conditions.

Q. Assuming these coincidences where you say it might be possible for Radford power tide to spill over the Bluestone spillway, what would be the effect by way of dampening out upon those Radford power tides in passing through the Bluestone reservoir?

2412 A. That would be enormously dampened out by the great surface area of the Bluestone reservoir.

Q. Please explain that.

A. The period of tide would necessarily be increased for 24 hours.

By Mr. THOMPSON:

Q. What is the area surface of the Bluestone reservoir?

A. Approximately 6,000 acres.

By Mr. JACKSON:

Q. Will you please proceed with your explanation?

A. The surface of that reservoir would act somewhat as a flood retarding reservoir in dampening out those tides, and greatly increase the duration of them, and lower the crest of them.

Q. What is the storage capacity for an inch of depth in the Bluestone reservoir at that elevation, 1,490?

A. About 500 acre-feet per inch of height, and that would make 6,000 acre-feet per foot, of height.

Q. How would the degree of dampening in the Bluestone reservoir of the Radford Power wave compare with the dampen-

ing which would occur to those same Radford power tides as they passed through the open river channel at the site of the Bluestone reservoir?

A. The dampening would be enormously greater with the Bluestone reservoir in place, than would have been the case in the original river channel.

Q. How does the power tide or wave depart from the equivalent natural flow?

A. I assume by that question you mean, how much does it vary above and below the natural flow?

Q. Yes.

A. By approximately half of its amplitude.

Q. How does that phenomenon affect the problem of reregulation of such waves?

2413 A. You mean reregulation by a reservoir?

Q. Yes. I think you had better explain what reregulation is first.

A. You speak of reregulation in the wave occurring when such wave enters the reservoir and it is dampened out by the reservoir so as to vanish altogether, so that the flow below the reservoir would be entirely uniform. I think I can explain that best by making a diagram.

(Court takes a recess.)

By Mr. JACKSON:

Q. Please proceed to make your diagram.

A. I think I can explain the principle of reregulation most clearly by an hypothetical triangular wave. On this triangular wave I will draw in the mean flow line marking it M-M, and will cross hatch the volume of crest wave above the mean flow line. In order to reregulate that wave in a reservoir, it would be necessary to have a reservoir whose volume is equal to the volume of the trough wave. I will crosshatch this trough, marking the crest of the wave C, the required volume of reservoir R—. The crest of the wave must exactly fill the reservoir if the reservoir is of the correct size to completely regulate the wave. On this triangular diagram, I will draw the base flow line and call attention to the fact that the volume of crest of the wave is just one-fourth of the volume of wave, because we can split that portion of wave below the mean flow line into three triangles, whose volume is each equal to the volume of the crest. Therefore, in this hypothetical wave of triangular shaped size the reservoir required to regulate the wave would have a volume equal to one-fourth the volume of wave.

In actual reservoirs or actual waves where the crests are somewhat rounded it would require a volume slightly larger than one-

fourth the wave volume to regulate waves so as to produce a uniform flow in the stream.

Q. Please state within what limits would that slightly increased volume be that would be required for reregulation of a wave with a somewhat rounded crest from the triangular wave you have used on your chart?

A. I made a computation for what is called a sine wave
2414 and in that case the volume of the crest is about one-third the volume of the wave. In waves such as we have on New River, the required volume would be between one-third and one-fourth of the wave volume.

Q. Could you draw on the bottom of that chart a series of small waves and draw the median line through them showing how much of the waves have to be taken care of in case of re-regulation, that is like the New River waves possibly that form a series of waves. Could you put it on the bottom of the chart?

A. I will draw the mean flow line on this diagram and the portion of waves that will have to be stored to regulate flow would be the portion above the mean flow line. Those crests above the mean flow line could be eliminated altogether by being stored in a reservoir having this volume.

Q. Now what would be the condition after that has been done, with reference to the flow?

A. The flow would be absolutely uniform, with the depth along the median line.

I will ask the Reporter to mark the chart Defendant's Exhibit 596.

(Said chart is marked Defendant's Exhibit 596.)

Q. Would you mind filling in the remaining valleys in the lower figures so that the chart will be complete?

(Witness does so.)

By Mr. JACKSON:

Now I offer in evidence the chart just marked Exhibit 596 and I also want to offer in evidence chart marked Defendant's Exhibit 595, which I believe I had marked but forgot to offer it.

(Said charts are filed, marked Defendant's Exhibits 595 and 596.)

Q. Prof. Thomas, what is the capacity of the London Pool on the Kanawha River, between elevation 614 and 611?

A. It is approximately 2,700 acre-feet.

Q. Will you state whether this 2,700 acre-feet of pondage in the London pool would be sufficient to re-regulate the Radford power tide resulting from the two forms of waves, that is, the rectangular wave with 9,000 second-feet amplitude and 8-hour duration, and the wave corresponding to Exhibit 594, about which you have already testified?

A. In each case the London Pool would have a volume several times greater than that required to regulate the waves from Radford.

By WITNESS:-

May I correct my last answer? I said the storage volume would be several times as great. The correct answer is that in case of a wave corresponding to Exhibit 594, the capacity will be two and half times as great as required and in case of rectangular wave it would be twice as great as required.

Q. When you speak of a rectangular wave, you refer to its form at Radford and not at Kanawha Falls?

2415 A. Yes, sir; at Radford.

Q. Now assuming that for some reason the three-foot draw down between elevations 611 and 614 in the case of the London Pondage would not be available for reregulating any Radford Power tides which might pass Kanawha Falls, and that no reregulation of these tides had been accomplished in any pond or reservoir upstream from the head of the London Pool, and assuming the Winfield and Gallipolis dams to have been completed and placed in operation. What, in your opinion, or rather what is your opinion as to whether any Radford power tide passing Kanawha Falls would be transmitted unchanged through the Kanawha navigation pools into the Ohio River, downstream from the Gallipolis dam?

A. I think it is improbable that these waves would be transmitted down those navigtaion dams. The surface area is very large, so large that variation in water level of about two inches in those pools would be sufficient to reregulate the power waves from the Radfort plant.

Q. A variation of water level of two inches in each pool?

A. In the Marmet and Winfield pools but if the Gallipolis pool were included, a variation of about three-fourths inch in water level would be sufficient to regulate the Radford waves, since the ordinary fluctuations in the level of those pools are much greater than two inches and more than three-fourths, I think it improbable that these waves would pass through.

Q. If they came in without reregulation, could these variations you have described, occur?

A. Yes, they would occur in those pools and thereby dampen out the waves o reregulate them.

Q. Could variations of three-quarters to two inches in pools of that character ever occur under other circumstances than the one assumed?

A. Yes, sir, in navigation pools a variation of the level of a few inches are very common, according to the regular course of operation.

Q. Assuming that no reregulation of power waves about which you have testified above the London Dam, would it be possible for any part of those power tides to pass the London Dam?

A. The question should specify whether London is to be used to regulate the waves, or not.

2416 Q. Assuming that London's storage reservoir is not to to used for reregulation at all, and assuming there has been no regulation upstream since the waves left Radford, under those conditions, in your opinion, could any part of these Radford power tides pass the London Dam?

A. Yes, I think if there was no regulation they could pass the London Dam.

Q. What would be the effect in your opinion?

A. If the London dam were not used for regulation, in other words, if its level were held exactly constant, the wave would pass right through the London Dam, or London plant.

Q. Assuming that the passage of these power tides through the London pool, without the use of the London pondage, without reregulation, upstream how would they compare with the fluctuations resulting from the operation of the London power station?

A. I do not follow the question clearly. Under these conditions, the London station would pass the wave through and the fluctuations of the wave would be the same as the fluctuations of the power station.

Q. What would be the relative magnitude of such power tides, if they passed through London pool, in comparison with the magnitude of the fluctuations produced below London dam, by the operations of the London hydro-electric plant?

A. (No answer.)

Q. That is, you said under all these assumptions, you thought some effect of these tides might pass London dam?

A. Yes, sir.

Q. I want to know how these power tides, as they pass London dam, below that dam, would compare with fluctuations produced below the dam by the operation of the London hydro plant?

A. The amplitude of the power tide, based on Exhibit No. 594, as I recall it, was stated by me to be 3,500 second feet. That would be the amplitude of that wave or that tide passing through the London station. At present, the variations of the flow through London are much larger than that—several times larger. I was in the

2417 London station when they were operating at 16,000 KW; that would be at about 10,000 second feet.

Q. Well, as this power tide, under the assumed conditions, passed London dam and went through Marmet, what would be the effect on it—would it be dissipated in fact, or not?

A. If the Marmet pool were not used or regulated at all, it would not be dissipated in the Marmet pool.

Q. Are you sure 16,000 was there at London or Marmet?

A. I am not sure. I am not certain of that; I had better say approximately that.

By Mr. JACKSON:

Q. Now, Professer Thomas, assuming that these power tides, about which you have testified, from Radford were not subjected to any reregulation, as they came to the London pool, and passed through the London, Marmet, and Winfield power stations, in your opinion, would they be recognizable in the Ohio River down stream from the Gallipolis dam?

A. If the Marmet, London, and Winfield pools were held mathematically at a constant elevation?

Q. No, sir. If the power tide came into the London pool or passed through the hydro-electric plants of these three dams, London, Marmet, and Winfield——

By Mr. JACKSON:

Q. The plants normal in operation?

A. With the pools fluctuating—with small fluctuations in the pools, they would absorb the waves and regulate them so that they would not be perceptible at the Ohio.

Q. Would that be true in merely normal fluctuations in the pools?

A. Yes, sir.

Q. You testified, Professor Thomas, that there would be no effect of these power waves from Radford observable below Gallipolis. By that answer, state whether or not you mean that there would be no effects of any power waves observable below Gallipolis in the Ohio River from anywhere?

A. You mean from other stations farther up the Ohio?

Q. Or anywhere else?

2418 A. I don't know of any stations that would produce any such fluctuations below Gallipolis.

Q. What about Winfield, on the assumption that it were completed?

A. If I may answer the question in a slightly indirect way: Winfield, London and Marmet have power stations. As I say, the waves are entirely obliterated at those stations, unless the operators of these stations, so to speak, try to pass them through by taking unusual precautions.

2419 The pools normally show some storage in the ponds to absorb waves. I should say that it would be improbable that any of these waves would pass through London, Marmet or Winfield dams and appear in the Ohio River.

Q. Is that the same as saying that, if there is any power tide below Gallipolis dam, that they would be there because of the operations of the operator of the Winfield dam?

A. I think that is correct; except that I do not know whether or not there is any other power station anywhere on the watershed within reaching distance of Gallipolis. I think there is not.

Q. Assuming there is none, would that be a correct statement?

A. Yes, sir.

Q. Professor Thomas, during periods of low or moderate flow through the Kanawha navigation pools, would physical conditions be such that silt would be deposited?

A. Very little silt would come down the river.

By Mr. JACKSON:

Q. Under those conditions, if any silt were deposited, in what parts of the pool would it be deposited?

A. In my opinion, silt would come so finely divided, it would be carried into the deeper parts of the pool.

Q. Is that answer applicable to each of the navigation pools on the Kanawha River?

A. Yes, sir. I should say so.

Q. What, in your opinion, would be the effect of the Radford reservoir upon the matter of silt in the New River?

Q. (Continuing):—and the Kanawha navigation pools?

A. In my opinion, the Radford reservoir would act as a silt catcher, catching practically all silt above that site.

By Mr. THOMPSON:

I thought you said that it would go into the deeper pools on down the river.

A. Into the deeper parts of these pools.

By Mr. JACKSON:

2420 Q. Referring to the Kanawha navigation pools, would the power tides from the Radford plant, or any other conceivable withholding of the flow at Radford dam, increase the amount of dredging needed to maintain the navigable depths at the heads of the Kanawha Navigation pools, when considered over a term of years?

A. No, sir.

Q. Would the amount of silt in the navigation pools be less or more than if the dam was not built?

A. Less.

Q. In the case of the Kanawha navigation pools, what would be the evaporation from the surface of the pools?

A. It would be very small, depending on the area of the pool. It would be small, in comparison with the leakage and lockage.

Q. Can you give an estimate, for instance, of the Winfield pool?

A. I made a computation of the evaporation from the Winfield pool, on the assumption of six inches of evaporation from the surface of that pool, during a very dry month, with no rainfall.

By Mr. JACKSON:

Q. What was your figure?

A. My figure was about 30 cubic feet per second.

2421 Q. I show you a book, which is marked Defendant's Exhibit No. 544, for identification. Do you know what it is?

A. Yes, sir; it is a report on Power waves of New River and the Kanawha River, prepared in the office of the United States Engineers at Huntington, West Virginia, February 29th, 1932.

By Mr. JACKSON:

Q. Are you familiar with that document?

A. Yes, sir.

Q. Or copies of it?

A. Yes, sir.

Q. Was one ever transmitted to you?

A. Yes, sir. A copy was sent to my laboratory.

Q. From where?

A. It came from the Secretary of the American Society of Civil Engineers', Special Committee on Hydraulic Research in Portland, Oregon.

By Mr. THOMPSON:

Q. When did it come to you?

By Mr. JACKSON. Can I finish?

By Mr. THOMPSON. No, sir.

A. Sometime during the spring; I am not certain about the date; my feeling is that it was about the 1st of May.

Q. How did it come to you? Was it sent in the ordinary mail and without solicitation on your part?

A. May I explain about that. I received that report—I am a member of the American Society of Civil Engineers and on a committee on research in regard to the traveling of waves. The Secretary of the Committee got out circular letters and sent them to all Engineers' offices in the United States, where he thought he could get information on traveling waves, and that letter

2422 was received in the Huntington office and this report was mailed from that office to the Secretary of our Committee and the Secretary mailed it to me.

By the COURT. It is not offered yet?

By Mr. JACKSON:

No, sir.

Q. Did you later have any communication from the District Engineers' office about it?

A. Yes, sir. They sent me a telegram, asking me to send the report to the Division Engineers' office of the War Department at New York.

Q. Did you see a copy of that report elsewhere?

A. Yes, sir, I saw a copy of that report.

Q. Where?

A. In the office of Colonel F. W. Scheidenhelm in New York City.

Q. Is that a copy?

A. I think this was the same copy [indicating].

Q. Is that Exhibit No. 545, the same as the copy of the report you received and have described?

A. No. 544—it is the same in my opinion; it is essentially the same. I have not checked it page by page.

By Mr. JACKSON:

Q. Were there any qualifications about this exhibit No. 544, or the copy of it, when it was transmitted to your committee, Professor Thomas?

A. No, sir.

Cross examination by Mr. THOMPSON:

Q. Professor Thomas, I believe you took your C. E. Degree in 1908, did you not?

A. Yes.

Q. Where did you take that degree?

A. At Columbia University.

Q. Then you started to teaching, didn't you, at Columbia?

A. Yes; that summer in the surveying camp.

2423 Q. You taught one summer?

A. Yes.

Q. You did not have anything to do with wave studies or anything while teaching, did you?

A. No.

Q. Then, you did a year and a half at Washington University?

A. Yes.

Q. You did not have anything to do with wave studies there, did you?

A. No.

Q. What did you teach?

A. I taught surveying and drawing.

Q. From 1910 to 1923 you were at the Rose Polytechnic Institute, were you not?

A. Yes, sir.

Q. That is where?

A. At Terre Haute, Indiana.

Q. You did not have any experience there or do any work in hydroelectric matters, did you?

A. I taught a course in water power engineering and had charge of student theses on design of water projects.

Q. That was wholly theoretical and technical, and had nothing to do with any practical work about hydroelectric projects or wave studies?

A. I don't know how you use the work "practical;" it was a student thesis work.

Q. You did not go out and make any studies of waves on the river, did you?

A. During the period at Terre Haute I studied flood waves on the Wabash.

Q. And what did you study on the Wabash River?

A. For the Pennsylvania Railroad.

2424 Q. What was the reason for that?

A. In connection with litigation arising from the 1913 flood.

Q. It had nothing to do with a hydro-electric plant?

A. No; flood waves.

Q. You were there with respect to what kind of walls they would build for the protection of the railroad right-of-way?

A. No; it was not that.

Q. What was it?

A. It was a damage case arising from damage caused by the 1913 flood.

Q. Then in 1923 you went to Carnegie Institute, was it?

A. Yes.

Q. And you taught there, didn't you?

A. Yes.

Q. In fact, most of your life—28 years of your life, at least, have been spent in teaching?

A. Yes, indeed.

Q. You have been in the class room?

A. Yes.

Q. I believe you said you did something on the Miami Conservancy District?

A. Yes.

Q. How long were you there?

A. I was there during the summer of 1918, and then I worked on the technical report in my spare time during the following winter.

Q. Now, isn't it a fact that you wrote a letter asking for a job by which you could make a little money during the summer and so fill out your professor's salary?

A. I do not recall writing a letter in those terms, and I am certain I did not write it in those terms. In fact, I did not write a letter there asking for a job. The request came from them to me, because of the article I wrote in the Engineering News.

2425 Q. Isn't it a fact you got about $200 a month for your work there?

A. No. I don't remember what I got, but it was not $200.

Q. It was $175, wasn't it?

A. I can't remember what it was, but the ordinary assistant's salary.

Q. You were assistant engineer with a great group of other assistant engineers who were there?

A. There were a number of others.

Q. And you held a very minor position?

A. I would not say it was a very minor position. The hydraulic engineers who had originally drawn up the program were in war service, and I had some extremely important work to do myself. I admit I was one of them.

Q. This paper you talk about you worked on, was written by Professor Woodward?

A. Professor Woodward was in charge, but I worked in his office.

Q. Were not there at least a dozen other engineers working on that?

A. Not on that technical report.

Q. On that data?

A. No.

Q. Do you know Mr. McWhorter here?

A. Yes, indeed.

Q. Do you remember him being there?

A. He mentioned to me today being there, and I have a vague recollection of it, but not clear.

Q. Do you mean to say you were not in any position other than a very minor assistant in the Miami Conservancy District?

A. I do not say very minor, but I was assistant engineer.

Q. And you did not have anything to do with the study of waves there with respect to a hydro-project?

2426 A. There was no hydroelectric work in the Miami Conservancy District. We studied waves in the river.

Q. The whole question was the building up of walls alongside where the river flows through the City of Dayton and further back, for the protection of another great flood of the character that they had?

A. That was only a part of the project.

Q. What was the other work?

A. The design of reservoirs.

Q. It was purely a flood control?

A. Yes.

Q. It was not in a mountainous country, either, was it?

A. No.

Q. It had nothing to do with power, did it?

A. No.

Q. Now then, I believe you went to the Great Northern Railroad, did you not?

A. Yes.

Q. What did you do there?

A. That was one of my first engagements when I was a young graduate just out of college.

Q. What kind of work were you doing?

A. I was appointed as a draftsman, sent out on the construction line in the office of the resident engineer. The resident engineer became sick, and I had to assume practically all the duties of that office.

Q. You did not have any wave studies there, did you?

A. No, except I will qualify that by saying we were very much interested in floods on the Snoqualmie River. It was my duty to locate the grade line of that river above the flood heights, and a part of my duty was to investigate that matter.

Q. I believe you went in 1914–15 with the Pennsylvania Railroad Company?

A. Yes.

2427 Q. And that was on the Wabash?

A. Yes.

Q. Your next was consulting engineer with the City of Pittsburgh, was it not?

A. Yes.

Q. What did you do on that job?

A. I made studies to determine the effect of certain proposed river walls at Pittsburgh on a flood height in the Pittsburgh district.

Q. And that did not have anything to do with hydroelectric problems, did it?

A. No, but it had to do with floods and rivers.

Q. Your whole duty was building up walls?

A. Yes, and to determine how those walls would be affected by the flood in the river.

Q. It did not have anything to do with the question of current other than the effect of current on a side wall?

A. We made studies up and down the river for many miles, an intricate study involving the behavior of floods, in the Pittsburgh district.

Q. I believe you said you had a position—that was 1927; how long were you in that job?

A. Do you mean by the City of Pittsburgh?

Q. Yes.

A. I worked on that—my impression is, in my spare time, about six months—all my spare time.

Q. You were teaching at the time, were you not?

A. Yes.

Q. How long were you occupied in your classes?

A. Fifty minutes—do you mean in the classes?

Q. No, I mean how many hours a week?

A. Oh, I think the hours of teaching run about 18—15 in the day and 3 at night.

2428 Q. Any professor who carries 18 hours a week has a pretty busy life, hasn't he?

A. Yes.

Q. You did not have much time to go on?

A. I worked day and night, Saturdays and Sundays, on that job.

Q. In 1928 you went to Philadelphia, didn't you?

A. Yes.

Q. What did you do there?

A. I had charge of the investigation and survey of the Delaware River.

Q. Did you give up your position of teaching?

A. No. I went to Philadelphia during the summer, and during the subsequent winter I worked on the report in my spare time.

Q. So the only time you were working in Philadelphia on a practical job was in the summer?

A. Yes.

Q. And that was how many months?

A. About four, or a little less.

Q. Four months?

A. Yes.

Q. Did you still have a job in Pittsburgh with regard to the flood problem there?

A. No, not during that summer.

Q. So that winter all you had was teaching 18 or 19 hours a week?

A. Yes.
Q. And writing this report?
A. Yes.
Q. You spoke about setting up this model testing plant in the Carnegie Tech, didn't you?
A. Yes, sir.
Q. What was that, what does it consist of?
A. You mean the laboratory?
2429 Q. Yes.
A. It is a Hydraulic Laboratory of the Carnegie Institute. We have pumps, flumes, tanks, etc., for testing hydraulic models, and measuring the amount of water.
Q. You can set up a model and make a test without ever looking at the proposition?
A. If we have proper maps supplied to us we can.
Q. As a matter of fact that is done there, and also done in Washington the same way, set up a model without the men ever having gone out on the project itself?
A. That is done, however we prefer to visit the project.
Q. It is a fact you set up an integrating model with respect to the Bluestone project before you ever saw it, didn't you?
A. With respect to New River, oh yes.
Q. And you made tests before you saw New River?
A. Yes, sir.
Q. And before you ever saw Bluestone reservoir site?
A. Yes, sir.
Q. So it is a purely theoretical proposition, isn't it, that kind of work?
A. I don't know what you mean by that.
Q. It isn't a practical operation, you never built a plant, a hydroelectric plant, did you?
A. No.
Q. Never operated one either?
A. Not until I operated this one the other day.
Q. You don't call that operating, do you?
A. No.
Q. How big is this model you speak of, how long is it?

By Mr. JACKSON:

The Bluestone model?

2430 By Mr. THOMPSON:

Any kind of model.

Q. You said you made models, how big are they?
A. On the Emsworth project we have one 88 feet long and about 28 feet wide.

Q. How long was the one you made for the Bluestone project?

A. We have three different models for the Bluestone project. One is about 30 feet by 13 feet. Another is a model of the spillway section in a glass flume about 30 feet long and 6 or 7 feet deep and 2 feet wide.

Q. And you compress then the distance or extent of the country for about say thirty-five or thirty-six miles into something that is about thirty-five feet long?

A. Yes, we can do that.

Q. Then you make your test on that?

A. Yes, sir.

Q. And you have not got any of the conditions such as the physical conditions around Bluestone in front of you, such as the stream flow and run-off and things of that kind?

A. Yes. When we make a model we have complete information of that kind.

Q. Where do you get your information regarding stream flow?

A. From the U. S. District Engineer office of the War Department. They furnish the information. As I said we have six men or possibly more now from the War Department working in our Laboratory all the time, and they correspond with their Home Office and survey parties and obtain data on the whole project.

Q. Where do you get your information with regard to stream flow?

A. From whatever source it is available.

Q. Do you get it from the Geological Survey?

A. It depends on the particular job we are working on.

2431 Q. Supposing it is on New River. Did you get it from the Geological Survey?

A. We got it directly from the U. S. Engineer office. I don't know where they got it.

Q. You accepted that?

A. On the design of the Bluestone project, yes, sir, as the only information available.

Q. You are not employed by the United States Government?

A. No, I don't suppose so.

Q. Your arrangement is with Carnegie Tech?

A. No, with Hydraulic Laboratory of Carnegie Tech.

Q. That is a subdivision of Carnegie Tech?

A. Yes, sir. It happens I am however responsible head of that, and keep our finances separate from the Institute, and I made the contracts and sign them myself.

Q. But you don't draw any salary from the U. S. Government?

A. No, we make the models under contract, and my time is included among other things.

Q. But the Carnegie Institute, that division, makes the model, and you happen to be the head of that division, is that it?

A. Yes, sir.

Q. Are you retained by the defendant in this case to testify here?

A. The defendant?

Q. That is the Appalachian Electric Power Company.

A. Yes, sir.

Q. What were you doing down at Emsworth?

A. When?

Q. You said you had some work at Emsworth.

A. We are making model studies in connection with the reconstruction of the dam.

2432 Q. How long have you known the Emsworth District?

A. Oh, I have lived in Pittsburg approximately thirteen years and probably went down to Emsworth the first year or so I was there. I have been there many times.

Q. They had the dam constructed long before thirteen years ago?

A. The Emsworth dam was constructed in 1921, the present dam.

Q. Do you know anything about the configuration of the channel of that river at Pittsburg?

A. Yes, sir.

Q. What is the base down at Emsworth of the channel?

A. Below Emsworth there is a deep hole in the channel below the dam.

Q. I mean right at Emsworth, what is the channel base made of?

A. It is a gravel channel.

Q. It is sandstone rock, isn't it, solid all the way across?

A. No, not right at the surface. They had to drive through a number of feet of gravel to reach the rock.

Q. You don't know what the condition of the river was before they had the dam there, do you?

A. Only in a general way.

Q. Do you mean to tell me that you were Consultant on the building of this dam at Emsworth, Pa., on the Ohio River, a few miles below Pittsburg, and that you had a gravel bed before you got to the sandstone rock?

A. I was not Consultant on the Emsworth dam. We are making model tests at the present time on that dam.

Q. These model tests—isn't it a fact what you do is to simply see that at the spillway the water that comes over there, whether it will cut into flows from the dam and cause a leak or a break-down?

A. That is part of what we do.

Q. What else do you do?

A. Many other things.

2433 Q. What else are you doing on the Bluestone?

A. Studying effect of cavitation, the forming of cavities.

Q. That is caused by dropping or falling water?

A. Yes, sir, and we are making another study to determine the best height of the coffer dams of the Bluestone, and another study to determine the proper curvature of the deflectors at the end of the outlet conduits.

Q. None of those problems have anything to do with wave studies made by power projects?

A. No.

Q. You don't know what the power capacity of the Bluestone is to be?

A. I paid no attention to that side of it. I don't think the design for that is prepared, at least not reported to me.

Q. They have preliminary plans?

A. We have nothing to do with the power end of it.

Q. You have not looked at the preliminary maps of it?

A. We have many maps of the site but have done nothing on the power end of it at our Laboratory.

Q. I think you said you made a study of #4 on the Monongahela River?

A. Yes, sir.

Q. That had to do with a power company, didn't it?

A. No, that is a navigation dam on the Monongahela River.

Q. So that had nothing to do with wave studies?

A. No.

Q. You also said you made a study on the Alleghany River?

A. Yes, sir.

Q. Where is the plant on the Alleghany located?

A. East Brady, Pa.

Q. That had nothing to do with wave studies?

A. No.

2434 Q. How about the Gallipolis plant, what were you doing down there?

A. We made studies on methods of controlling the direction of the velocity of currents at locks and (interrupted).

Q. That had to do with the water going through locks?

A. Yes, sir; and we also made studies of the roller gates, to determine a schedule of operation of roller gates, and a study to determine the pressure on the roller gates.

Q That had nothing to do with the effect of the waves downstrea.. below where the roller gates were?

A. No.

Q. Or the waves coming in from up above?

A. No.

Q. The fact is, you have had practically no experience with this question of wave study, have you?

A. I have had very extensive experience with wave studies.

Q. With respect to power plants?

A. No; the general waves in open channels.

Q. They are not like the waves from power plants, where you have peak loads?

A. They are the same hydraulic problem.

Q. They are in no sense uniform in their procedure downstream, are they?

A. No.

Q. And that is open channel work to a great extent too, isn't it?

A. Yes, sir.

Q. Is that the same condition as where you have a situation like you have on New River, where you have the Bluestone which may be operated, and the Radford project, where they are building one, and where you have the Buck and Byllesby up above working on peak loads; you don't have any such condition in these streams you speak of, where you have made studies, such as on the Monongahela and Alleghany Rivers?

A. Not exactly like that.

2435 Q. Professor, yesterday I asked you about your experience at the Miami Conservancy District. You knew that Col. Edward A. Deeds was Chairman of the Board of Directors there, didn't you?

A. Yes.

Q. I think you stated you went there and worked during the summer of 1918?

A. My recollection is 1918; it may have been 1917. I said that from memory, and did not look up the record. I can't say now whether it was 1917 or 1918. It was during the war, at a time shortly before the Armistice was signed.

Q. You stated, didn't you, the reason why you went there was because there was a shortage of engineers due to the war, and that there had been vacancies left there?

A. That was not the reason I went there. It was a condition that existed there when I arrived there.

Q. Isn't it a fact that Col. Deeds had all of these engineers on that project placed upon a priority, and not a single one of them, with one exception, withdrew or had withdrawn from that Miami Conservancy work?

A. I don't know that.

Q. And did you know a man by the name of Kenneth Grant, as one of the engineers?

A. I don't know him personally, but I know him by reputation.

Q. You would not be able to say that he was the only one who left there of that group of engineers?

A. I know Mr. Ross Riegal was absent.

Q. But he was not absent owing to the war?

A. I don't know. My impression is some reason connected with the war, but I am not certain of that.

Q. So you would still persist in saying there were a great many openings for engineers?

2436 A. I do not know about a great many openings, but I know that when I came there there was nobody I could consult on technical features of hydraulic design except Professor Woodward, who was not there when I first came there.

Q. In "Who's Who" I believe you claim to be the joint author of this article we were discussing yesterday, this technical report No. 7?

A. I didn't know that I was mentioned in "Who's Who."

Q. In engineering?

A. I don't know about that. I never knew I was mentioned in "Who's Who" in engineering.

Q. You never sent in your statement about articles of which you were the author?

A. No, I have no recollection of it.

Q. You do not claim then to be the coauthor?

A. No. I worked on that manuscript and wrote the original version of that manuscript. I was the author of the manuscript under the direction of Professor Woodward.

Q. Isn't it a fact that all the data on that whole report was collected under Professor Woodward, and all you did was to assemble it?

A. No. I actually wrote the report—the greater part of it. There was a certain amount of it written after I left there, but the greater part of it was written by me that summer.